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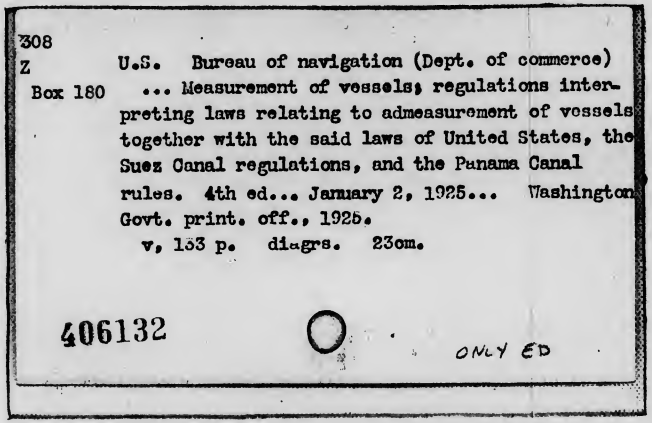

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MEASUREMENT OF VESSELS

REGULATIONS INTERPRETING LAWS RELATING TO ADMEASUREMENT OF VESSELS, TOGETHER WITH THE SAID LAWS OF UNITED STATES, THE SUEZ CANAL REGULATIONS, AND THE PANAMA CANAL RULES

1925

UNITED STATES
DEPARTMENT
OF COMMERCE

BUREAU
OF
NAVIGATION

DEPARTMENT OF COMMERCE
BUREAU OF NAVIGATION

MEASUREMENT OF VESSELS

REGULATIONS INTERPRETING LAWS RELATING TO ADMEASUREMENT OF VESSELS, TOGETHER WITH THE SAID LAWS OF UNITED STATES, THE SUEZ CANAL REGULATIONS, AND THE PANAMA CANAL RULES

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JANUARY 2, 1925

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DEPARTMENT OF COMMERCE,
BUREAU OF NAVIGATION,
Washington, January 2, 1925.

To Collectors and Surveyors of Customs and Others Concerned:

This edition, which is published for your guidance and information, supersedes the edition issued in 1919. The contents have, to a small extent, been rearranged and rewritten, and the instructions given by general letters and otherwise on the various questions that have arisen since the previous edition and the Panama Canal Rules have been embodied herein.

D. B. CARSON, *Commissioner.*

Approved.
S. B. DAVIS, *Acting Secretary.*

MEASUREMENT OF VESSELS

Part I.—INSTRUCTIONS FOR THE TONNAGE MEASUREMENT OF VESSELS

PRELIMINARY

ARTICLE 1. (*a*) Before any vessel shall be registered, enrolled, or licensed she shall be measured by an officer of the customs at the place where she may be.

(*b*) A vessel is not to be measured unless she is required by law to be registered, enrolled, or licensed, or otherwise specially provided for.

(*c*) The Commissioner of Navigation is charged with the supervision of the laws relating to the admeasurement of vessels, and on all questions of interpretation growing out of the execution of the laws relating to this subject his decision is final. (Act of July 5, 1884.)

GROSS TONNAGE

PRINCIPAL DIMENSIONS

ART. 2. (*a*) The marine document of every vessel shall show the date and place of build; the register length, breadth, depth, and, in vessels of more than two decks, the height of the upper deck to the hull above the tonnage deck; the number of decks[1] and masts; build as to her head[2] and stern; capacity under the tonnage deck, that of the between decks, and also, separately, permanently inclosed spaces on or above the upper deck to the hull available for cargo or stores or for the berthing or accommodation of passengers (provisionally) or crew, and the omitted spaces, whether open or closed in, on, above, or below the upper deck; the gross tonnage; items of deduction; and net tonnage.

In enumerating the number of decks only those which are without such openings as exempt the spaces beneath from being included in the tonnage under the upper deck are to be considered. Other decks, if any, containing such openings as exempt the spaces beneath from measurement for tonnage should be separately described after the number of decks proper; e. g., "Two decks and shelter deck," or as the case may be.

[1] Partial orlop decks, forward or aft, not extending through cargo holds are not considered as decks.

[2] Vessels of ordinary form may be described as having a plain, figure, or billet head, according to the absence or presence of a figure or billet. In steam vessels the head is usually "plain," in vessels fitted with bowsprit usually "billet."

In addition to what are commonly known as masts, spars set up at the center line of the bridging at the top of king-posts of certain vessels for signals and wireless antennae, etc., are to be considered as masts. The number of king-posts and derrick posts, etc., independent of the supported masts are to be separately stated after the number of said masts; e. g., "Two masts and eight king-posts," or as the case may be.

(*b*) All measurements are to be taken in feet and fractions of feet, and all fractions of feet shall be expressed in decimals.

TONNAGE DECK

ART. 3. (*a*) The tonnage deck in vessels having three or more decks to the hull shall be the second deck from below; in all other cases the upper deck of the hull is to be the tonnage deck. (Fig. 1.)

(*b*) If the second deck from the keel consists of several partial decks extending with breaks from stem to stern, and if the partial decks are at different heights, the line of the lowest will be taken as the tonnage deck, and the headroom above such line under the higher will be measured as a break.

REGISTER LENGTH

ART. 4. (*a*) The length from the fore part of the outer planking of wooden vessels, or forward end of lap of outer plating of steel or iron vessels, on the side of the stem to the after part of the main sternpost; that is, the one to which the rudder is usually attached,[3] measured on the top of the tonnage deck, shall be accounted the vessel's length. (Figs. 1 to 5.)

(*b*) The register length of scows and barges, with a square bow and stern sloping up from the bottom to the deck and with neither stem nor sternpost, is to be taken on the deck from the extreme point of the hull at the bow to the extreme point of the hull at the stem; that is, the over-all length of the hull, not including guards or rubbing strakes, is to be considered the register length of such vessel. (Fig. 6.)

BREADTH OF BEAM

ART. 5. The breadth of the broadest part of the vessel from outside to outside, exclusive of fender strake, rubbing strake, overhanging deck, etc., shall be accounted her breadth of beam, which may be found by any practical means. (Fig. 7.)

DEPTH OF HOLD

ART. 6. (*a*) Register depth is the depth of the midship transverse section from the underside of the tonnage deck plank to the ceiling, if any, in the hold, average thickness, at the side of the keelson or to the inner plating of a double bottom for water ballast less the ceiling exclusive of the timbers between the ceiling and double bottom in a direction perpendicular to the keel and parallel to the middle longitudinally vertical plane of the vessel. This direc-

[3] In the case of screw vessels with no sternpost take the length to the forward side of the rudderstock or line of same through the deck.

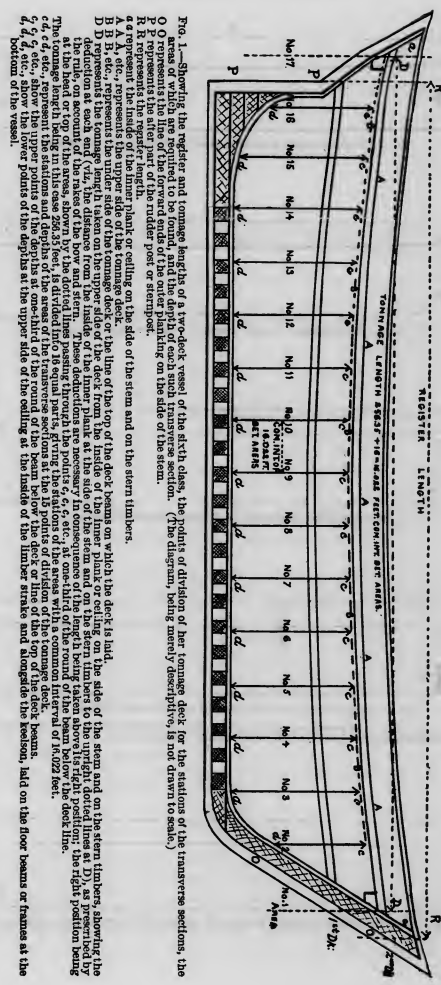


FIG. 1.—Showing the register and tonnage lengths of a two-deck vessel of the sixth class, the points of division of her tonnage deck for the stations of the transverse sections, the areas of which are required to be found, and the depth of each such transverse section. (The diagram, being merely descriptive, is not drawn to scale.)

O O represents the line of the forward ends of the outer planking on the side of the stem.

P P represents the line of the after part of the outer planking on the rudder post or sternpost.

R R represents the register length.

a a represent the inside of the inner plank or ceiling on the side of the stem and on the stern timbers.

A A, etc., represents the upper side of the tonnage deck.

D D represents the tonnage length taken on the upper side of the deck from the inside of the inner plank or ceiling on the side of the stem and on the stern timbers, showing the deduction at each end (viz, the distance from the inside of the inner plank at the side of the stem and on the stern timbers to the upright dotted lines at D), as prescribed by the rule, on account of the rakes of the bow and stern. These deductions are necessary in consequence of the length being taken above its right position; the right position being on the line of the forward ends of the outer planking on the side of the stem and on the after part of the rudder post or sternpost.

The tonnage length being in this case 256.35 feet, is divided into 16 equal parts, giving the stations of the areas with a common interval of 16.022 feet.

c c, *c c*, etc., represent the stations and depths of the areas of the transverse sections at the 15 points of division of the tonnage deck.

d d, *d d*, etc., show the upper points of the depths at one-third of the round of the beam below the deck or line of the top of the deck beams.

d, *d*, the lower points of the depths at the upper side of the ceiling at the inside of the timber strake and alongside the keelson, laid on the floor beams or frames at the bottom of the vessel.

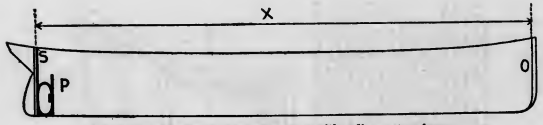


FIG. 2.—Register length of screw steamers with ordinary stern frame.

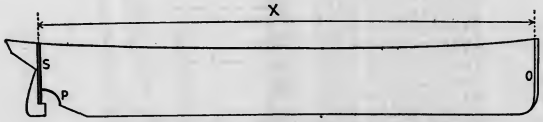


FIG. 3.—Register length of screw steamers with new-type stern frame.

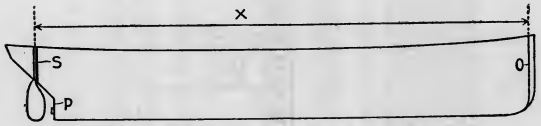


FIG. 4.—Register length of type of screw steamers on the Lakes.

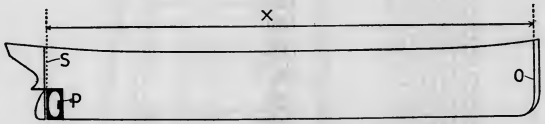


FIG. 5.—Register length of screw steamers of the "Great Northern" type.

In figs. 2, 3, 4, and 5, X represents registen length; O, line of forward ends of outer planking on side of stem; P, propeller post; and S, after part of stern frame or main sternpost.

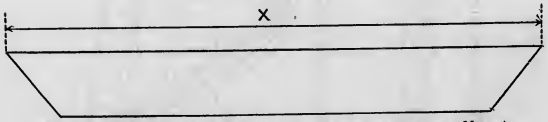


FIG. 6.—X, register length of scows or barges with neither stem, sternpost, nor rudderpost.

tion may be determined by means of a square placed upon the upper side of the keelson, or inner plating of said double bottom, or by other practical means. (Fig. 7.) If there is no ceiling in the hold, this depth is the depth similarly taken to the top of the floor timber at the side of the keelson, or to the inner plating of said double bottom.

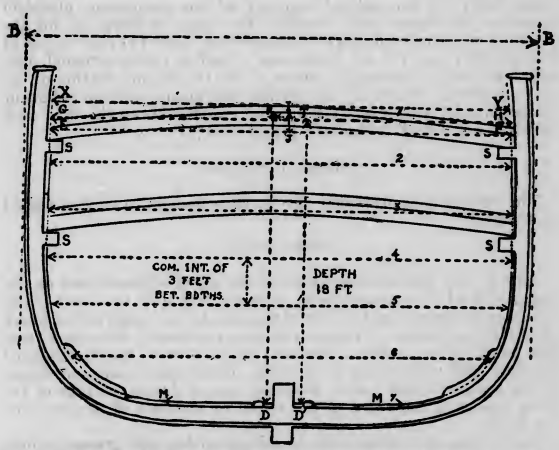


FIG. 7.—Register breadth, register and tonnage depths, round and one-third round of beam, and breadths of a midship section of a vessel fitted with a ceiling and whose depth of hold exceeds 16 feet. *B B* represents the register breadth; *I J* represents the round of beam, the distance from the crown of the under side of the deck to the line *E F* drawn from the top of the deck beam at one side to the same point on the other side; *I K* represents one-third of the round of beam; *E D* represents register depth; *T D* represents the tonnage depth; *1–7* represent the breadths of the section between the ceiling (average thickness) on the frames at the sides taken at the common interval of 3 feet apart, the tonnage depth of 18 feet being divided by 6; *G H* represents the upper breadth passing through the point *K*, the point of one-third round of beam; *M M* represents the lower or seventh breadth, passing through the points *D D'* at the inside of the limber strakes and extending as far as the apparent flat of the ceiling on the floors; *S S S S* represent deck-beam shelves.

(*b*) If the vessel has three or more decks to the hull, then the height from the top of the tonnage deck plank to the underside of the deck plank of the uppermost such deck shall be accounted as the height of the spar deck above the tonnage deck.

GROSS TONNAGE

ART. 7. (*a*) The tonnage measurements are taken for the purpose of ascertaining the internal capacity of measured spaces of vessels in tons of 100 cubic feet each, which measurers should proceed to find as soon as the vessel is sufficiently advanced in construction as to permit its being done, usually when the decks are laid or deck beams placed in position and the hold sufficiently cleared of material, etc.

(*b*) In case of steam vessels, the hold should be measured before the boilers and machinery are installed and the tanks filled with water.

(*c*) The gross tonnage of a vessel shall consist of the sum of the following items: (1) The cubical capacity below the tonnage deck; (2) the cubical capacity of each space between decks above the tonnage deck; (3) the cubical capacity of the permanent closed-in spaces on the upper deck available for cargo or stores or for the berthing or accommodation of passengers or crew; (4) the "excess of hatchways"; and (5) all permanent closed-in spaces situated elsewhere available for cargo or stores, or for the accommodation of the crew, or for the charts and navigating instruments (except cabins or staterooms for passengers constructed entirely above the first deck which is not a deck to the hull [R. S. 4151]).

UNDERDECK TONNAGE

The cubical capacity below the tonnage deck is to be ascertained as follows:

TONNAGE LENGTH

ART. 8. (*a*) Measure the length of the vessel of usual sheer on the upper side of the tonnage deck, from the inside of the inner plank (average thickness), at the side of the stem to the inside of the plank on the stern timbers or frames (average thickness), deducting from this length what is due to the rake of the bow in the thickness of the deck and what is due to the rake of the stern timber or frame in the thickness of the deck, and also what is due to the rake of the stern timber in one-third of the round or one-half of the pitch of the beam.

In the case of a vessel with no ceiling on her side frames subject to the deductions above noted, measure the length, as above described, from the point of intersection of the lines of the inner face of her cargo battens on the frames, or, where no battens are fitted, from the point of intersection of the lines of the inner faces of her frames at or near the stem to the inner face of the battens on the stern frames, or, if no battens are fitted, to the line of the inner faces of the stern frames. Where the point of contact of the outer plating on the side of the stem, especially in the case of iron or steel vessels, is near the forward face of the stem, the forward terminal of the tonnage length will be at the after face of the stem, as indicated in Figure 8, but where such contact is near the after face of the stem, the said terminal will be aft of the after face of the stem a distance equal approximately to the depth of the frames near the bow.

(*b*) It may, however, sometimes be impracticable to ascertain either of the terminal points of the tonnage length on the upper side of the deck. In such cases the same result may be more conveniently reached by taking the length below the tonnage deck, from the inner planking under the deck hook, at the side of the stem to the inner planking on the stern timbers or frames; adding the rake of the bow in the thickness of the deck hook and the rake of the stern in the thickness of the deck timber or beam less one-third round of beam thereat. (Figs. 9 and 10.)

In the case of iron or steel vessels with the deck plating of the tonnage deck uncovered, the rakes of the bow and stern timber, etc., in the thickness of such plating are negligible and may be disregarded altogether, but in the case of wooden vessels with thick decks it is important that such rakes be determined, which may be done as follows:

Place the hinged rule,[4] referred to in article 55 (*c*), so that the outer edge of one leg will rest on the upper surface of the tonnage deck and the outer edge of the other leg on the inner face of the stem or stem lining or parallel thereto, finding the angle of inclination of the stem to the deck; then lay off with chalk, or other material that will make a visible mark, this angle on the deck or some smooth surface, and above the deck line of the angle so laid off, at a distance equal to the thickness of the deck, draw a line parallel to said deck line, extending it to the stem line of the angle; then draw a perpendicular from the vertex of the angle to the said parallel line and measure the distance from the foot of the said perpendicular therein to the stem line of the angle. The distance so found represents the rake of the stem in the thickness of the deck. (Fig. 9.) Similarly, the rake of the stern timber in the thickness of the deck of a ship with a stern ranging from a sharp to an elliptical stern may be found, one-third of round of beam in such cases being negligible. In a ship with a broader stern, the parallel line described above will be drawn at a distance equal to the sum of the thickness of the deck and one-third of round of beam at the stern; but otherwise the procedure will be the same as outlined above, and the rake so found will be the rake of the stern timber in the sum of the thickness of the deck and one-third of round of beam at the stern. (Fig. 10.)

The rakes of the stem and stern timber, in the thickness of the deck hook and aftermost deck beam or timber, respectively, are found in the same way, which rakes are required to be found only when the tonnage length is taken under deck instead of on it, owing to obstructions or erections thereon at the time of measurement. The parallel line drawn for finding the length of such rake of the stem is to be at a distance equal to the depth of the deck hook, under which the length has been taken; in broad-stern vessels such rake of the stern timber is found by drawing the parallel line at a distance equal to the thickness of the aftermost deck beam or timber less one-third of round of beam at the stern.

Method (*a*) will be used in all cases wherever possible, so it is desired that such vessels be admeasured before they are too far advanced to take their tonnage lengths on deck because of the adjustment of bowsprits or erections constructed thereon, especially in the case of wooden vessels propelled wholly or partly by sails.

(*c*) Divide the length so taken into the number of equal parts required by the following definition of classes, according to the class to which the vessel belongs (R. S. 4153), marking with chalk or otherwise the points so fixed and numbering them consecutively from bow to stern, No. 1 being at the extreme point of the length at the bow.

[4] Instead of the hinged rule any other instrument for finding angles under similar circumstances may be used.

Class 1. Vessels of which the tonnage length according to the above measurement is 50 feet or under: Divide into 6 equal parts.

Class 2. Vessels of which the tonnage length according to the above measurement is above 50 feet, and not exceeding 100 feet long: Divide into 8 equal parts.

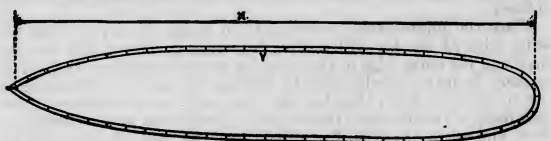


FIG. 8.—Tonnage length of uncelled vessels. *X* represents tonnage length; *Y* represents line of interior faces of frames.

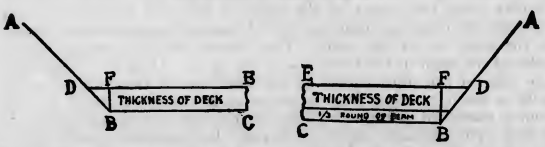


FIG. 9.—Showing the rake of the stem in the thickness of the deck.
Angle *A B C* represents the angle of inclination of the stem and deck lines as determined by the hinged rule; *D E* represents the line drawn parallel to and at a distance from the deck line equal to the thickness of the deck; *B F* represents the perpendicular from the vertex of the angle *A B C* to the parallel line *D E*; and *D F* represents the amount of the rake of the stem in the thickness of the deck.

FIG. 10.—Showing the rake of the stern timber, in the thickness of the deck and one-third round of beam.
Angle *A B C* represents the angle of inclination of the line of one-third round of beam and the line of the stern timber; *D E* represents the line drawn parallel to and at a distance from the line of one-third round of beam equal to the thickness of the deck and one-third round of beam; *B F* represents the perpendicular from the vertex of the angle *A B C* to the parallel line *D E*; and *D F* represents the amount of the rake of the stern timber in the thickness of the deck and one-third of round of beam.

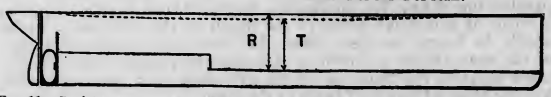


FIG. 11.—Register and tonnage depths of vessels with a break in the double bottom. *R* represents register depth; *T* represents tonnage depth.

Class 3. Vessels of which the tonnage length according to the above measurement is above 100 feet, and not exceeding 150 feet long: Divide into 10 equal parts.

Class 4. Vessels of which the tonnage length according to the above measurement is above 150 feet, and not exceeding 200 feet long: Divide into 12 equal parts.

Class 5. Vessels of which the tonnage length according to the above measurement is above 200 feet, and not exceeding 250 feet long: Divide into 14 equal parts.

Class 6. Vessels of which the tonnage length according to the above measurement is above 250 feet: Divide into 16 equal parts.

BREAKS IN DOUBLE BOTTOM

(*d*) The tonnage length of a vessel having a break or breaks in the line of her double bottom is to be divided into longitudinal sections (one more than the number of breaks) by erecting transverse vertical planes at such breaks.[5] The length of each such section so found is then to be divided into a number of equal parts according to the class in the above table to which it belongs, just as if it were the length of a separate ship: *Provided*, That such sections as are 20 feet or under in length may be divided into two equal parts, and those above 20 feet and not exceeding 40 feet in length may be divided into four equal parts instead of into six, as indicated in the table.

(*e*) The tonnage depth of the middle of the tonnage length will determine the number of parts into which all the remaining tonnage depths are to be divided. The register depth of the vessel is also to be taken at this point (Fig. 11).

TRANSFER OF SECTIONS TO KEELSON

ART. 9. (*a*) The tonnage length having been determined and the number of sections to be measured and the interval between them ascertained, a line is then to be extended down the main hatchway, at the middle line of the ship, in a direction perpendicular to the keel, by means of a square placed on the upper side of the keelson.

(*b*) The distance of the midship section from this line at the tonnage deck is then to be set off from the line in the same direction on the keelson, which gives the position of the midship section [6] on the keelson, and the positions of the other sections are obtained on the keelson by setting off afore and abaft of the midship section the common interval between them as already determined.

ROUND OF BEAM

ART. 10. (*a*) The round-up or spring of the beam of vessels whose tonnage-deck cambers, which must be known before taking the exact length of the vessel, as well as before measuring the depths of the areas, may be taken either at the underside of the deck by stretching a small line tightly from end to end of the top of the beam, which will show the round or spring of the beam at the center; or it may be taken, if more convenient, at the upper side of the deck by stretching a line tightly across, held at equal heights from the deck at each side of the ship, so as just to touch the crown of the deck at the middle line; then the distance from the deck to the line at the ship's sides gives the round-up or spring of the beam. It is necessary to take the round of beam at each point of division of the length except when the vessel has a parallel or nearly parallel breadth. In lieu of the above methods, it may be ascertained on the basis of one-fourth of an inch to the foot of beam at each section in iron or steel vessels of the usual camber of beam. This method is more accurate and easier of application than the others.

(*b*) The round or spring of the beam is the perpendicular distance from the crown of the underside of the tonnage-deck plank at

[5] If the break does not exceed 0.5 of a foot, it may be ignored.
[6] The position of the midship section at the bottom may be determined by any other practical means.

the center to a line stretched athwart the vessel from end to end of the top of the beam and is to be ascertained at every place where it is to be used in the measurement.

PITCH OF BEAM

ART. 11. (*a*) In vessels whose tonnage deck has a pitch instead of a camber from its side at the shell plating to its center, find the height of the pitch of the beam at the places where the round of beam of vessels with decks rounding up to the center is required to be found. It may be done in any practical manner.

(*b*) The height of the pitch of the beam is the perpendicular distance from the apex of the underside of the tonnage deck plank or plating at the center of the deck to a straight line from end to end of the top of the beam and must be ascertained at every place where it is to be used in the measurement. (Fig. 12.)

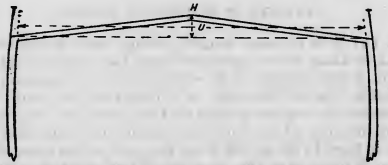


FIG. 12.—*H*, height of pitch of beam; *U*, the upper breadth through one-half height of pitch

TRANSVERSE AREAS [7]

ART. 12. (*a*) Then, the hold being sufficiently cleared to admit the required depths and breadths being properly taken, proceed to find the transverse area at each point of division of the length, as follows:

(*b*) Measure the depth at each point of division from a point at a distance of one-third of the round, or one-half of the pitch (fig. 12) of the beam below the tonnage deck or, in case of a break, below a line stretched in continuation thereof to the upper side of the ceiling, if any, on the floor timbers or frames of vessels of transverse framing, or on the bottom longitudinals [8] of vessels of longitudinal framing, otherwise to the upper side of the said floor timbers or frames or longitudinals at the inside of the limber strake. (Fig. 7.)

In vessels with a raised platform in the bottom and no ceiling fitted the depths are to be taken down through the platform to the upper side of the floor timbers or frames, as described above, deducting therefrom the thickness of the platform in question.

In vessels constructed with a double bottom for water ballast, depths are to be taken down to the upper side of the inner plating of the double bottom, which shall be deemed to represent the floor timber, provided the collector can certify that the space between the inner and outer plating is not available for the carriage of cargo, stores, or fuel. This question will not, however, arise as a rule in the case of double bottoms constructed on the cellular principle where the floors extend the full depth of the space; but, as regards double bottoms, other than those of cellular construction, collectors must satisfy

[7] In the case of whaleback vessels and others of peculiar construction, refer the matter of method for finding transverse areas to the bureau for instructions, submitting with such reference a midship cross section and other plans by which the form of the vessel in question may be determined.

[8] For the purpose of measurement, the bottom longitudinals of vessels of longitudinal construction are to be considered as the floor timbers.

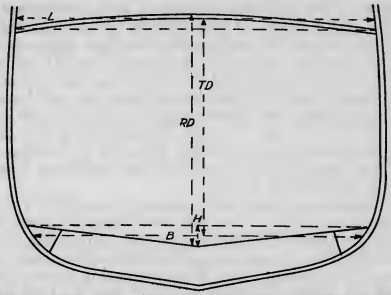


FIG. 13.—*H*, height of dead rise; *B*, bottom breadth through one-half of dead rise (*H*); *RD*, register depth; *TD*, tonnage depth; *L*, upper breadth passing through the point of one-third round of beam

themselves that the requirements of the act of March 2, 1895, relating thereto are complied with. If there is a ceiling on the double bottom, an allowance is to be made for it; but no allowance is to be made for scantlings or stringers, if any, on the double bottom for supporting the ceiling.

When the top of the double bottom has a dead rise immediately from or a pitch at its center, deduct one-half of dead rise from or

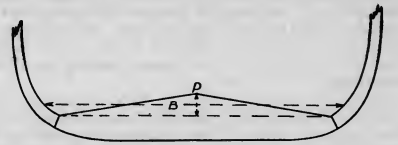


FIG. 14.—*P*, pitch of double bottom; *B*, breadth through one-half pitch of double bottom

add one-half height of pitch to the depth to the center of the double bottom to establish the bottom terminus [9] of the depth of the transverse sections falling in way of same. (Figs. 13 and 14.)

In the case of vessels with double bottoms of other than cellular construction and used other than for water ballast, take depths to the top of floors therein, as in the case of vessels with a raised platform in the bottom.

[9] The bottom terminus of register depth is to be located at the point of one-half of pitch.

Where transverse sections fall in holds, insulated for refrigerating purposes, and the insulation at the bottom extends more than 3 inches above the top of the floors or double bottom, a maximum allowance of 3 inches may be made; but if such insulation is less than 3 inches thick, only the actual thickness may be allowed; that is, the depths will be taken to the top of it, as in the case of ordinary ceiling, but no allowance will be made for insulation at the underside of decks.

(*c*) Then, if the depth of the midship division of the length do not exceed 16 feet, divide each depth into four equal parts.

(*d*) Then measure the inside horizontal breadth at each of the three points of division, marked on the sliding rods placed in position as directed in article 50 (*b*), and also at the upper and lower points of the depth, extending each measurement to the average thickness of that part of the ceiling or cargo battens which are between the points of measurement, or, should there be no ceiling or battens between these points, to the inside of the ordinary frames, not to the web or strengthening frames.

Where transverse sections fall in holds, insulated for refrigerating purposes, and the insulation on the sides thereof extends beyond the edges of the frames and is thicker than the ceiling similarly situated elsewhere in the ship, a maximum allowance of 3 inches on each side may be made for ceiling. But if the insulation is less than 3 inches thick allow the actual thickness thereof; that is, take the breadths to the faces of the insulation, as in the case of ordinary ceiling.

Where there are top-side tanks or side tanks extending up from the top of the double bottom or floors wholly or partly to the deck above, take breadths similarly on through the said tanks to the inner faces of the vessel's frames, deducting from these breadths the thicknesses of the inner plating of the tanks.

In small vessels with "false ceiling" in the portion of their cabins in their holds or forming a part of their seats or lockers, etc., therein, and which stands off from their frames—that is, not fitted to them as ordinary ceiling—take the breadths through the said "false ceiling" to the inner faces of the vessel's frames, deducting therefrom the thickness of the "false ceiling" on each side. If, however, there is a ceiling fitted on the frames in addition to the "false ceiling," take the breadths to the ceiling on the frames, making no allowance for the "false ceiling."

(*e*) In finding the upper breadth of each transverse section make no allowance for the excess of the deck-beam shelves, etc., over the average thickness of ceiling, if any, thereunder; that is, it is to be taken between the lines of the inner faces of the said ceiling, if any, otherwise to the lines of the inner faces of the frames of the vessel.

Referring to Figure 7, it will be observed that after the deck is laid the upper breadth (represented by the line *G H*) passes through the deck on each side. Hence, it is impossible to take it at its true position. In such cases take it on the deck, allowing within the rough tree timbers the thickness of the ceiling on the sides of the vessel under deck, if any, as shown by line *X Y* in the figure.

Owing to deck-beam shelves or other obstructions, it can be more conveniently and accurately taken here than under the deck, and, besides, it will be only 4 to 6 inches from its true position. In vessels which have upright sides the said breadth so taken will be correct, but in the case of vessels with inclining sides the necessary allowance must be made for the deviation of the sides from the upright in the 4 or 6 inches above the true position of the said breadth.

In the case of vessels with three or more decks, take the upper breadth of each transverse section on the tonnage deck in the same manner.

(*f*) The bottom breadths[10] are to be taken only so far as the flat of the floor extends. Where there is a rise immediately from the keelson, the bottom breadth is equal to the width of the keelson.

(*g*) Number these breadths from above, numbering the upper breadth 1 and so on down to the lowest breadth.

(*h*) Multiply the second and fourth by 4 and the third by 2.

(*i*) Add these products together and to the sum add the first breadth and the last, or fifth.

(*j*) Multiply the quantity thus obtained by one-third of the common interval between the breadths, and the product shall be deemed the transverse area.

(*k*) But if the midship depth exceed 16 feet, divide each depth into six equal parts instead of four and measure, as before directed, the horizontal breadths at the five points of division and also at the upper and lower points of the depth; number them from above as before, multiply the second, fourth, and sixth by 4, and the third and fifth by 2; add these products together and to the sum add the first breadth and the last, or seventh; multiply the quantities thus obtained by one-third of the common interval between the breadths, and the product shall be deemed the transverse area.

(*l*) This process will be repeated at every section. Care should be taken in all measurements to bring them to the average thickness of the ceiling to avoid any device to lessen the measurement by making the ceiling thicker at the point cut by the sections. Care must also be taken that the sections shall be parallel to each other and at right angles to the axis of the vessel.

(*m*) The intervals and one-third intervals between the breadths are to be carried to the nearest hundredth of a foot and the interval and one-third interval between the areas to the nearest thousandth of a foot.

CUBICAL CONTENTS UNDER TONNAGE DECK

ART. 13. (*a*) Having thus ascertained the transverse area at each point of division of the length of the vessel, as required above, proceed to ascertain the register tonnage of the vessel in the following manner:

(*b*) Number the areas successively 1, 2, 3, etc., No. 1 being at the extreme limit of the length at the bow and the last number at the extreme limit of the length at the stern.

(*c*) Then, whether the length be divided according to the table, into 6 or 16 parts, as in classes 1 and 6, or any intermediate number, as in classes 2, 3, 4, 5, multiply the second and every even-numbered

[10] The bottom breadths of transverse sections of ships of longitudinal construction falling in the hold where there is no double bottom and where there is a dead rise of the bottom out to the sides of the ship may be considered to be equal to the sum of the widths of the flanges of the angle bars on each side of the center bottom longitudinal, which are riveted to the bottom shell plating, and the thickness of the said longitudinal, amounting to about 1.2 feet.

area by 4 and the third and every odd-numbered area, except the first and last, by 2.

(*d*) Add these products together and to the sum add the first and last, if they yield anything;[11] multiply the quantities thus obtained by one-third of the common interval between the areas, and the product will be the cubical contents of the space under the tonnage deck.

(*e*) Divide this product by 100, and the quotient, being the tonnage under the tonnage deck, shall be deemed to be the register tonnage of the vessel, subject to the additions hereinafter mentioned.

SPECIAL EXEMPTED WATER-BALLAST PEAKS, ETC.

ART. 14. Any space other than the double-bottom space adapted only for water ballast, certified by the collector not to be available for the carriage of cargo, stores, supplies, or fuel, shall be deducted from the gross tonnage as measured to get gross register tonnage. (Act of Congress, February 6, 1909.)

Adaptation for water ballast consists of being connected only with the bona fide ballast system, consisting of the ballast pump and pipe lines for the intake and discharge of ballast, especially with the discharge lines. These spaces may be filled through sea valves or intake pipes, but in all cases they must be connected with the discharge lines and entered only through circular or oval manholes, whose greatest diameter must not exceed 24 inches in the water-tight deck, or plating covering the ballast spaces. If the manhole is in a plate covering a former hatchway to any of these spaces, the plate must be riveted water-tight to the hatchway coaming or deck, not merely held in place by bolts that may be removed whenever it is desired to use the spaces otherwise than for water ballast. These manholes may be provided with a coaming not exceeding 24 inches in height. When these spaces are found used other than for water ballast, they are to be added to the gross tonnage of the vessel, and so included until such changes have been made as will preclude their use otherwise than for water ballast and adapt them only for this purpose.

BETWEEN DECKS

ART. 15. If a vessel has a third deck, or spar deck, the tonnage of the space between it and the tonnage deck shall be ascertained as follows:

(*a*) Measure, in feet, the inside length of the space, at the middle of its height, from the plank at the side of the stem to the plank on the timbers at the stern when ceiled; but if there is no ceiling, take the length in the manner directed for taking tonnage lengths in such cases. Divide the length into the same number of equal parts into which the length of the tonnage deck is divided.

(*b*) Measure also at the middle of its height the inside breadth of the space at each of the points of division, also the breadth of the stem and the breadth of the stern (if round, as in the case of poops of similar form); number them successively 1, 2, 3, etc., commencing at the stem; multiply the second and all other even-numbered breadths by 4 and the odd-numbered breadths, except the first and last, by 2; to the sum of these products add the first and last breadths; multiply the whole sum by one-third of the common interval between the breadths, and the result will give, in superficial feet, the mean horizontal area of such space.

(*c*) Measure the mean height between the planks of the two decks and multiply by it the mean horizontal area, and the product will be the cubical contents of the space; divide this product by 100, and the quotient shall be deemed to be the tonnage of such space and shall be added to the other tonnage of the vessel, ascertained as aforesaid.

(*d*) If the vessel has more than three decks, the tonnage of each space between decks above the tonnage deck shall be severally ascertained in the manner above described and shall be added to the tonnage of the vessel, ascertained as aforesaid.

[11] The extreme points of the length at the bow and stern, though described as being the positions of the first and last areas, do not in vessels of usual form yield any area, as the vertical transverse section at each of those places vanishes into a mere horizontal line. Therefore, in the computation for tonnage, where the first and last areas form part of the process, a cipher must be employed in their places. But in vessels of unusual form, as, for instance, in barges or other craft in which the bow and stern are upright, with breadth also at those places, sections at the extreme points of the length will yield areas; in which cases such areas must be measured and used in the computation as the rule directs.

HATCHWAYS

ART. 16. The cubical contents of the hatchways[12] shall be obtained by multiplying the length and breadth together and the product by the mean depth taken from the top of the beam to the underside of the hatch cover. From the aggregate tonnage of the hatchways there shall be deducted one-half of 1 per cent of the gross tonnage of the ship exclusive of the tonnage of the hatchways, and the remainder only shall be added to the said gross tonnage.

DECK HOUSES AND SPACES ON THE UPPER DECK

ART. 17. (*a*) Nothing shall be added to the gross tonnage for any sheltered space above the upper deck which is under cover and open to the weather; that is, not inclosed.

(*b*) If there be a break, a poop, or any other permanent closed-in space on or above the upper, or spar deck, available for cargo or stores, or for the berthing or accommodation of passengers or crew, the tonnage of such space (except the cabins and staterooms for passengers on a deck not to the hull exempted by law) shall be ascertained as follows and added to the tonnage of the vessel:

(*c*) Measure the internal mean length of such space in feet and divide it into an even number of equal parts, the common length of which shall be most nearly equal to that of the parts into which the length of the tonnage deck has been divided.

(*d*) Measure at the middle of its height the inside breadths, namely, one at each end[13] and at each of the points of division, numbering them successively 1, 2, 3, etc., then to the sum of the end

[12] The hatchways referred to are the ones out in the open or in open spaces on the upper deck to the hull and on closed-in deck erections. Hatchways on between decks and on open deck erections are not to be measured and included in the aggregate of hatchways from which the statutory deduction is to be made. The total hatchways on between decks and on the portion of the decks within closed-in erections on the upper deck to the hull are included in the between deck spaces and in the said erections by the process of measurement; and, of course, the hatchways on open deck erections are not to be considered, serving as they do spaces not entering into the tonnage of the vessel.

[13] The breadth at the round end of round-end houses (erections) are to be found in the same manner as provided for finding the breadth at the after end of poops on round-stern ships. (Art. 18.)

breadths add four times the sum of the even-numbered breadths and twice the sum of the odd-numbered breadths, except the first and last.

(*e*) Multiply the whole sum by one-third of the common interval between the breadths; the product will give the mean horizontal area of such space.

(*f*) Then measure the mean height between the planks of the decks and multiply by it the mean horizontal area, divide the product by 100, and the quotient shall be deemed to be the tonnage of such space and shall be added to the tonnage under the tonnage deck ascertained as aforesaid.

AFTER BREADTHS OF POOPS ON ROUND-STERN SHIPS

ART. 18. If the after part of an ordinary poop is elliptical, make the breadth at the aft (extreme) end equal to one-half of the preceding one; but if it is round, as usually found on lake vessels, two-

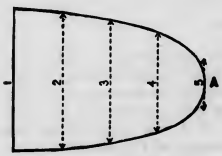


FIG. 15.—After breadth of poops, or between decks of similar form, on round (elliptical) stern vessels

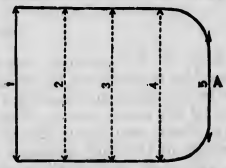


FIG. 16.—After breadth of poops, or between decks of similar form, of the type of round-stern vessels as found on the Lakes

In Figs. 15 and 16 *A* represents after breadth

thirds of the preceding one. Take the length of said space at half height along the middle line from the inside of the frames, or stiffeners, of the forward bulkhead to the inside of the stern frame when no ceiling is present. Make division of the length as aforesaid. Measurements of the other unceiled addible erections on or above the upper deck are to be taken inside of the frames, or stiffeners, of the same. (Figs. 15 and 16.)

DECK ERECTIONS

ART. 19. (*a*) In deciding whether or not deck erections are permanent closed-in spaces on the upper deck and should be measured and added to the tonnage, the measurer should have regard to the character and structural condition of such erections on the upper deck at the time when they are presented to his notice.

(*b*) Poops, bridges, or any other erections with one or more openings in the sides or ends not fitted with doors or other permanently attached means of closing, but otherwise so closed in as to be not only available but also actually fitted and used for the berthing or accommodation of passengers, must be measured and added to the tonnage.

CLOSED-IN SPACES WHICH MAY BE EXEMPTED

ART. 20. The following exceptions to the general rule of measuring all closed-in or weather-protected spaces on or above the upper deck are allowed:

(*a*) Any closed-in space or spaces solely appropriated to and fitted with machinery.[14]

(*b*) The wheelhouse for sheltering the man or men at the wheel.

(*c*) The cookhouse and also the bakeries when fitted with ovens and used entirely for such purposes.

(*d*) The condenser space.

(*e*) Water-closets or privies for the officers and crew; and in the case of vessels fitted particularly for passengers, an additional one may be allowed for every 50 persons; not more than 12 are, however, generally necessary.

(*f*) Skylights and domes affording ventilation, light, and air to the erection served, but none of the space below the roof or covering of such erection is exempt except where an opening is left in the floor of the superstructure directly under the skylight to give ventilation

FIG. 17.—*A b c d B* is the skylight serving the superstructure *E F G H*, and *A B C D* is the portion of the superstructure directly under the skylight and over the opening in the floor of the superstructure, affording light and ventilation to the dining saloon below

and light to a dining saloon, etc., below the said floor. This additional exemption, however, is to be approved by the Commissioner of Navigation. The request for such approval is to be accompanied by a blue print or sketch of the said space. (Fig. 17.)

(*g*) Companions, except the portion of them used as a smoking room, and booby hatches used exclusively to protect companionways and ladders leading to spaces below, whether such spaces are exempt or not; but such companionways as are not in exempted spaces will be included in gross tonnage and deducted therefrom in

[14] In small motor boats where the engine room communicates by passages or doorways (used by passengers or in handling freight or cargo) with, or is not cut off at all from, the space in the hold used for other purposes than propelling machinery directly under a house above deck and open to the hold, but otherwise closed in, a portion of said house directly over the engine, comprised within the projections of the terminl of the length of the engine room below deck as measured, or within the projection of one terminus of said length and the end of the compartment over the engine, one-half of the outside breadth of the vessel at the middle of the length of the engine space and the height of the house, may be considered as machinery space above deck. If such a house shelters only the engine and the space strictly required for its operation, and which space is not used at all for other purposes, or if a compartment of a reasonable size of such a house, formed by bulkheads, through which there is no means of entrance to other parts of the space under the house, or means of entrance only for the engineer in the usual routine of his work, shelters such engine space, the whole of the house or compartment may be considered as machinery space above deck.

ascertaining the net tonnage, if serving exclusively deducted spaces. Provided always that the spaces are no larger than required for the purposes mentioned.

SHELTER DECK SPACES

ART. 21. (*a*) Subject to the foregoing exception, poops, bridges, or any other permanent erections with one or more openings in the sides or ends not fitted with doors or other permanently attached means[15] (except as provided for below) of closing them should not be measured and included in the tonnage.

Tonnage openings in the bulkheads of such open isolated erections as forecastles, bridges, and poops, and such openings in the ends or sides of roundhouses on the upper deck to the hull, and on such shelter decks as are practically weather decks, may be temporarily closed by sliding or shifting boards let into channel bars at the sides of such openings, or by plates or boards held in place by hook bolts, spaced not under 1 foot apart, grasping the angular stiffeners at the sides of such openings, or by cross pieces so arranged as not to be held in place by cleats or other attachments to, or bolts through, the bulkhead (figs. 18 to 22b); but in no case is battening or gaskets of any material permitted. The same temporary means of closing, except by plates, the tonnage openings in the bulkheads of the well under the tonnage opening in a shelter deck and in the intermediate bulkheads, if any, in the shelter deck, forecastle, bridge, and poop spaces, are permitted. Tonnage openings in the side or ends of roundhouses not on weather decks as defined above may be temporarily closed by mesh screens or latticework, or shifting boards up to one-half height of the openings.

(*b*) The minimum width and height of the permanent openings in the bulkheads are fixed at 3 and 4 feet, respectively, and if coamings are fitted thereto their height must not exceed 2 feet.

(*c*) A single opening at one side of a bulkhead of the size prescribed above is not considered sufficient to entitle the space thus partitioned off to exemption, unless in addition to this there are a number of freeing ports and scuppers fitted on each side of the space claimed. However, if the opening is at least 4 feet wide and 5 feet high, or its equivalent, with a coaming not in excess of 2 feet in height, freeing ports are not required. In such cases the owner's application for exemption and also a sketch of the space drawn to scale must be forwarded to the Commissioner of Navigation for examination, and exemption must not be allowed without the bureau's approval.

If freeing ports are fitted in the side walls of the space, they must have an open area of at least 1.2 square feet and be located immediately above the sheer strake, provided that the bottom edge of the freeing ports is not more than 18 inches above the weather deck at side of vessel.

(*d*) When exemption from measurement is claimed for the space between the upper and shelter decks on the ground of a permanent middle-line opening in the shelter deck, the length of this opening

[15] Cleats, stud bolts, and hinges attached to, and bolt holes in, bulkheads at the edges of a tonnage opening are considered some of the permanently attached means of closing it.

must be at least 4 feet in the clear and its width equal at least to the width of the after-cargo hatchway on the same deck. In other words, the horizontal area of the opening, subject to the allowance for openings with rounded corners, as provided for below, must equal the area of a square-cornered hatchway 4 feet long in the clear and as wide as the after-cargo hatchway on the same deck:

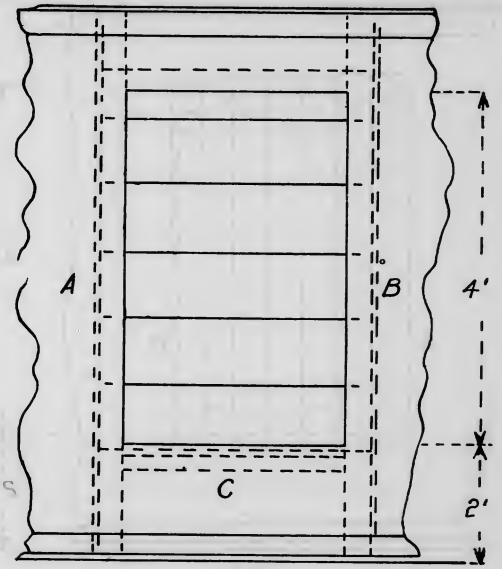


FIG. 18

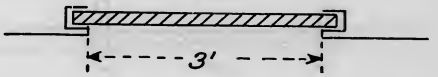


FIG. 19

FIGS. 18 and 19.—Elevation and cross section at *A B* of opening temporarily closed by shifting boards let into channel bars at sides of opening; *C*, coaming

Provided, That an opening with rounded corners with radii not in excess of 1.5 feet may be considered to be square. If the opening is oval or has round corners with radii in excess of 1.5 feet and is no wider than the after-cargo hatchway, the length of the central portion of its width must exceed 4 feet in order to produce the required mean length.

To find the mean length of such an oval or round-cornered opening, divide its width into eight equal parts; then find the length at each point of division and at each end, finding the end lengths in the manner provided for finding the breadth at the after end of a poop on a round stern vessel (art. 18, figs. 15 and 16); then to the

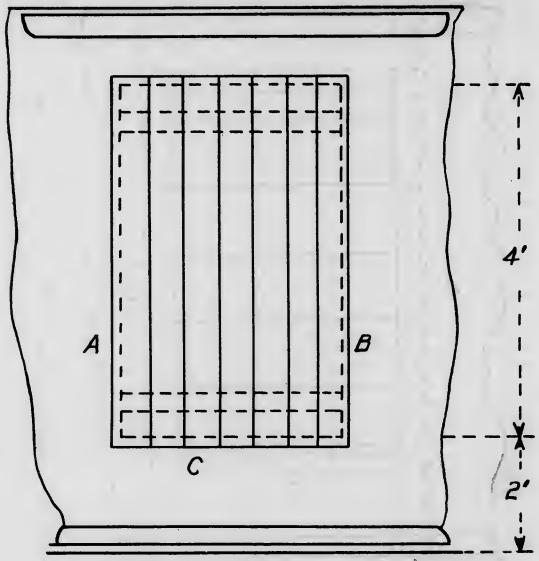


FIG. 20

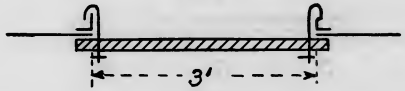


FIG. 21

FIGS. 20 and 21.—Elevation and cross section at *A B* of opening temporarily closed by vertical boards battened together and held up by hook bolts; also they may be held up by cross pieces (22*b*) instead of hook bolts; *C*, coaming

sum of the end lengths add four times the sum of the even-numbered lengths and twice the sum of the odd-numbered lengths, except the first and last; then divide the total sum by 24. The result will be the required mean length.

The distance between the after edge of the deck opening and the aft side of the sternpost must not be less than one-twentieth the regis-

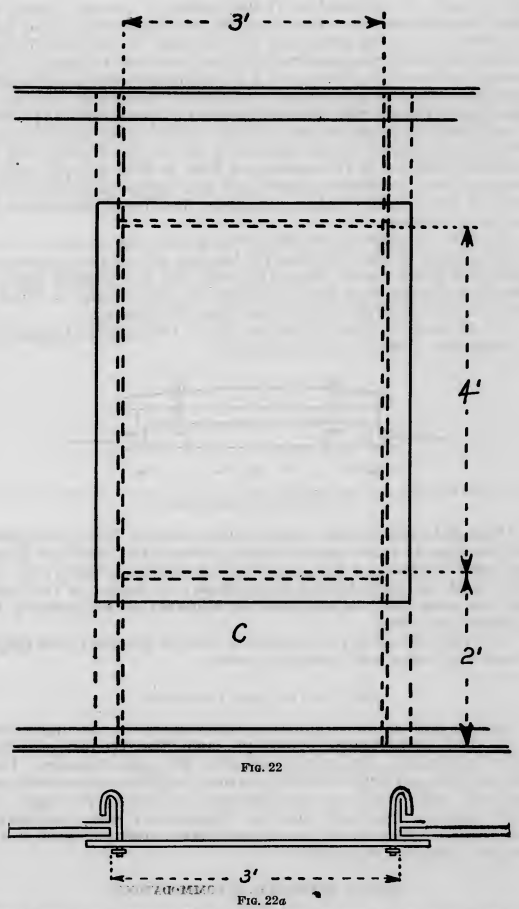


FIG. 22

FIG. 22*a*

FIGS. 22 and 22*a*.—Elevation and cross section of opening temporarily closed by a plate held up either by hook bolts or by cross pieces (fig. 22*b*); *C*, coaming

tered length of the vessel, or if the opening is placed forward the fore side must not be less than one-fifth the length of the vessel from the stem. When the permanent deck opening is situated aft, there must be at least two openings in all the transverse bulkheads in the between decks on the foreside of it to entitle the space to exemption, and these openings must comply as regards dimensions and size of coamings (if any) with the requirements of paragraph (*b*) above.

(*e*) There must also be on each side of the space directly under the tonnage opening in the shelter deck at least one freeing port, located as indicated in (*c*) above, and have at least an open area of 2 square feet. In addition there must be a suitable number of scuppers not less than 3½ inches in diameter distributed throughout the shelter deck space.

(*f*) The coamings to the deck opening must not exceed 12 inches extreme mean height, including the beading, etc., at the top for confining the hatch covers above the deck, and the opening must be fenced with guardrails and stanchions, the latter being so fitted as not to lend themselves to battening down the opening.

(*g*) If portable wood covers are fitted, the lashings beneath for holding them down are to be of hemp.

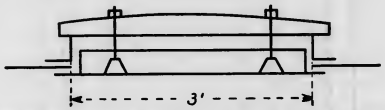


FIG. 22b.—Cross section of opening temporarily closed by plate or battened boards held up by bolts and cross pieces

If a metal cover is used, it may be held down by hook bolts spaced not less than 18 inches apart, passing through the cover and grasping angle stiffeners or flanges on the sides of the coaming; but the bolts must not pass through the stiffeners or flanges of the coaming, nor must there be any other attachments on the coaming for fastening the cover.

(*h*) All openings in the upper deck must be provided with proper means for closing and battening down.

SHELTER FOR DECK PASSENGERS

ART. 22. Cabins and staterooms immediately on the upper deck to the hull, permanently "closed in" and fitted up for permanent use of passengers, are to be included in the gross tonnage. They will be exempted only when they have no berthing accommodations and have only temporary arrangements to protect passengers on short voyages from rain and the shipment of seas, constituting sheltered spaces above the upper deck under cover and open to the weather; that is, not inclosed.

SPECIAL PASSENGER ACCOMMODATIONS

ART. 23. (*a*) No part of any vessel will be required to be measured or registered for tonnage that is used for cabins or staterooms and constructed entirely above the first deck which is not a deck to the hull (R. S. 4151). Such cabins[16] and staterooms must be set apart exclusively for passengers; and when occupied by the officers or other members of the crew, wherever situated, they shall be included in gross and, under certain conditions, deducted therefrom in ascertaining the net tonnage.

(*b*) In the case of Army transports, colliers, supply ships, hospital ships, etc., the term "passengers" shall include all officers, enlisted men, and other persons who are not assigned to ship's duties and not entered on the ship's articles, and no deductions for spaces occupied by such persons shall be made, nor are cabins and staterooms occupied by them to be included in gross tonnage when situated on a deck not a deck to the hull.

DECK TO THE HULL

ART. 24. The uppermost deck, extending from stem to stern, which has a direct bearing upon the frame timbers, or a portion of them, and also to which the hull extends continuously with none of the openings required in shelter deck spaces from stem to stern, even though lighter than other decks in the vessel, having its hatchways or other openings provided with means for closing them against the action of the sea and weather upon the space below inclosed by the sides of the vessel, and making the said space a fit place for the stowage of general cargo, like a hold, is the upper deck to the hull; that is, it is the uppermost continuous deck within the boundaries of the hull. Partial decks above this, even though supported by the frames of the vessel, are not to be regarded as decks to the hull.

RECORD OF EXCLUDED SPACES

ART. 25. (*a*) The tonnage measurement of all spaces above the upper deck that the measurer has not included in the gross tonnage of the vessel should be given in detail on Catalogue 1410, "Tonnage admeasurement," which, if forwarded to the bureau for test and examination, should be accompanied by any plans, sketches (drawn to scale), or explanation required for the proper consideration of the exemption of such spaces.

(*b*) Should there be no spaces above the upper deck which have been exempted, this should be noted on Catalogue 1410, "Tonnage admeasurement."

(*c*) The measurer should be careful to record in the space provided on the above form the principal dimensions, tonnage, and position of all spaces above the upper deck that are not included in the cubical contents forming the ship's registered tonnage.

(*d*) All doubts arising in the minds of the measurers concerning decks to the hull, inclosures on or above the upper deck, shelter

[16] A cabin is defined as an apartment usually containing smaller rooms (staterooms) in the sides furnished for dwelling in by the master and officers, and in large ships also affording sleeping accommodations (and other dwelling spaces) for passengers. A passenger cabin, as applied to modern ocean-going steamers, is usually comprised of staterooms, bathrooms, barber shops, dining rooms, pantries, elevators, foyers, saloons, playrooms, etc. Such spaces as barrooms, cafés, lounges, libraries, music rooms, social halls, smoking rooms, gymnasiums, swimming pools, and Turkish baths, not in cabins with staterooms but in separate apartments, are not considered as a part of a cabin. However, in the case of day steamers and ferries operating on short runs on rivers, bays, lakes, etc., and which are not provided with staterooms, etc., the closed-in spaces commonly called saloons, and other spaces used solely for the accommodation of passengers, may be considered as cabins.

decks, and all other points, accompanied by sketches of the spaces and all the facts bearing on the same, should be submitted to the Commissioner of Navigation for his decision.

OPEN VESSELS

ART. 26. In ascertaining the tonnage of open vessels the upper edge of the upper strake is to form the boundary line of measurement, and the depth shall be taken from an athwartship line extending from the upper edge of said strake at each division of the length.

NET TONNAGE—DEDUCTIONS FROM GROSS TONNAGE

GENERAL RULE

ART. 27. Deducted spaces which are rectangular in shape are to be measured by taking the product of the three dimensions, but when

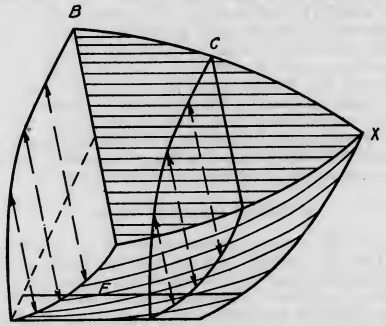


FIG. 22*c*.—*F*, flooring 1 foot above the top of vessel's bottom frames; *B*, position of the after section; *C*, position of the middle section; and *X*, position of the forward section, which being at the sharp end of the vessel yield no area

bounded by one or more curved surfaces conforming to the sides of the vessel below the tonnage deck, with the exception of propelling machinery space whose measurement is provided for in article 39, they are to be measured according to the formula for measuring peak tanks as given on the back of Catalogue 1410 and indicated in Figures 22*c* and 22*d*. However, in the case of small vessels, these spaces, 8 feet or less in length, may be measured in any practical manner. Deducted spaces in the between decks, or erections on or above the upper deck conforming to the sides of the between deck or said deck erections, are to be measured according to article 17.

If there is a flooring to give a flat surface at the bottom of deductible spaces under the tonnage deck not more than 1 foot above the top of the bottom frames, and the space between the flooring and the said frames is not used or available for any other purpose, take depths of transverse sections to the top of the said frames and find

areas accordingly, just as in the case of transverse sections for finding the tonnage below the tonnage deck of the vessel. If the flooring is more than a foot above the said frames, or if the space between the flooring and the frames is used for a purpose that does not entitle it to deduction, then find the areas only of the portion of the sections above the flooring.

The depth of deducted spaces extending from top to bottom of a deck erection may be taken between the same points as the depths used in finding the tonnage of the erection. In other words, if the erection was measured before the flooring, if any, was laid and the ceiling or paneling, if any, overhead was fitted, and depths were taken from the underside of the covering planks of the roof as required by the law and regulations (R. S. 4153, act of Mar. 2, 1895, sec. 1(*h*) and art. 17) to the steel deck beneath, the flooring and overhead ceiling are to be disregarded in depths of the various deducted

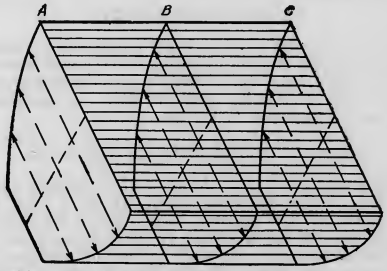


FIG. 22*d*.—*A*, position of the after section; *B*, position of the middle section; *C*, position of the forward section

spaces. But in determining the number of men that may be berthed in a space (act Mar. 4, 1915) only the internal capacity in the clear will be considered.

DEDUCTIONS

From the gross tonnage [17] of every vessel of the United States there shall be deducted—

CREW SPACES

ART. 28. The tonnage of the spaces or compartments occupied by or appropriated to the use of the crew of the vessel. In spaces appropriated to the use of the crew may be included passageways serving exclusively such spaces, spaces reasonable in extent, necessary to shelter the cook when employed in the preparation of provisions, the engineer when employed in condensing water for the crew, the chief engineer's office used exclusively in official duties, and the wireless operator when engaged in his work or where he may be berthed,

[17] Gross tonnage referred to in the following articles is the gross register tonnage; that is, the gross tonnage exclusive of all exemptions, including water ballast, etc. This to be the basis of all percentage deductions, such as propelling power, boatswain's stores, storage of sails, etc.

water-closets or privies, mess rooms and bathrooms or washrooms exclusively for the use of the officers and crew. But none of these spaces when used by the passengers are to be deducted, nor is the clerk's, purser's, or paymaster's office to be deducted.

PENALTY FOR OBSTRUCTING CREW SPACES

Every place for berthing the crew shall be kept free from goods or stores not the personal property of the crew in use during the voyage, with the exceptions noted below, and if any such place is not so kept free the master shall forfeit and pay to each seaman or apprentice lodged therein the sum of 50 cents per day for each day during which any goods or stores as aforesaid are kept or stored therein after complaint has been made to him by any two or more of the seamen so lodged.

MARKING OF CREW SPACES

ART. 29. No deduction shall be made unless there is permanently cut [18] in a beam [19] and over the doorway of every such place the number of men it is allowed to accommodate, or purpose for which used, with these words, "Certified to accommodate —— seamen," "Certified mess room," "Certified W. C.," etc.

DIMENSIONS AND REQUIREMENTS OF CREW SPACES

Every place appropriated to the crew of a seagoing vessel of the United States, except a fishing vessel, yacht, a pilot boat, and all vessels under 200 tons register, built prior to November 4, 1915, shall have a space of not less than 72 cubic feet and not less than 12 square feet measured on the deck or floor of that place for each seaman or apprentice lodged therein: *Provided*, That any such seagoing sailing vessel built or rebuilt after June 30, 1898, and prior to November 4, 1915, shall have a space of not less than 100 cubic feet and not less than 16 square feet measured on the deck or floor of that space for each seaman or apprentice lodged therein. Such place shall be securely constructed, properly lighted, drained, heated, and ventilated, properly protected from weather and sea, and, as far as practicable, properly shut off and protected from the effluvium of cargo or bilge water: *Provided further*, That on all merchant vessels of the United States the construction of which shall be begun after November 4, 1915, except yachts, pilot boats, or vessels of less than 100 tons register, every place appropriated to the crew of the vessel shall have a space of not less than 120 cubic feet and not less than 16 square feet measured on the floor or deck of that place for each seaman or apprentice lodged therein, and each seaman shall have a separate berth, and not more than one berth shall be placed one above another. Such place or lodging shall be securely constructed, properly lighted, drained, heated, and ventilated, properly protected from weather and sea, and, as far as practicable, properly shut off and protected from the effluvium of cargo or bilge water; and every such crew space shall be kept free from goods or stores not being the personal property of the crew occupying said place in use during the voyage.

[18] This is construed to mean that certifications are to be center punched or otherwise cut where the material over the doorway is metal, whether a beam or plating; or carved when it is wood, so that they will not be obliterated when painted over.

[19] This is construed to mean the beam over the doorway on the inside of the space. In the absence of such a beam the certification may be marked on the doorframe or other fitting on the inside over the doorway.

HOSPITAL SPACES

That in addition to the space allotment for lodgings hereinbefore provided on all merchant vessels of the United States which in the ordinary course of their trade make voyages of more than three days' duration between ports, and which carry a crew of 12 or more seamen, there shall be constructed a compartment, suitably separated from other spaces, for hospital purposes, and such compartment shall have at least one bunk for every 12 seamen constituting her crew, provided that not more than six bunks shall be required in any case.

WASH ROOMS AND BATHROOMS

All merchant vessels of the United States the construction of which shall be begun after November 4, 1915, having more than 10 men on deck must have at least one light, clean, and properly ventilated washing place. There shall be provided at least one washing outfit for every two men of the watch. The washing place shall be properly heated. A separate washing place shall be provided for the fireroom and engine room men, if their number exceed 10, which shall be large enough to accommodate at least one-sixth of them at the same time and have hot and cold water supply and a sufficient number of washbasins, sinks, and shower baths.[20]

Any failure to comply with this section shall subject the owner or owners of such vessel to a penalty of not less than $50 nor more than $500: *Provided*,

FUMIGATION

That forecastles shall be fumigated at such intervals as may be provided by regulations to be issued by the Surgeon General of the Public Health Service, with the approval of the Department of Commerce, and shall have at least two exits, one of which may be used in emergencies.

EXEMPTIONS

Fishing vessels, yachts, pilot boats, and vessels under 200 tons register (gross) built prior to March 4, 1915, and yachts, pilot boats, and vessels under 100 tons register (gross) built since, are specially exempted from the provisions regarding the amount of space which shall be appropriated to the crew and its use during the voyage for goods or stores not the personal property of the crew.

MISSISSIPPI RIVER STEAMBOATS

Every steamboat of the United States plying upon the Mississippi River or its tributaries shall furnish an appropriate place for the crew which shall conform to the requirements of section 2 of the

[20] Section 6, act Mar. 4, 1915.

act of March 3, 1897, and section 2 of the act of March 4, 1915, so far as they shall be applicable thereto, by providing sleeping room in the engine room, properly protected from the cold, winds, and rain by means of suitable awnings or screens on either side of the guards, or sides, and forward, reaching from the boiler deck to the main or lower deck, under the direction and approval of the Supervising Inspector General of Steam Vessels, and shall be properly heated.

MASTER'S CABIN

ART. 30. Any space exclusively for the use of the master certified by the collector to be reasonable in extent and properly constructed, and the words "Certified for the accommodation of master" to be permanently cut in a beam [21] and over the door of such space. This space includes sleeping room, dressing room, bathroom, office, and passageways serving the master's accommodations.

NAVIGATION SPACES, ETC.

ART. 31. Any space reasonable in extent used exclusively for the working of the helm, the capstan, and the anchor gear, when below deck, or for keeping the charts, signals, lamps, and other instruments of navigation and boatswain's stores and the words: "Certified for steering gear," or "Certified for boatswain's stores," or "Certified chart house," as the case may be, to be permanently cut in the beam [22] and over the doorway of each of such spaces.

The space commonly known as chain locker is to be considered and, subject to the above restrictions, treated as space for anchor gear. When the space in the fore peak under the tonnage deck is so used, as is often done in wooden vessels, it is to be measured in the manner prescribed for measuring fore-peak tanks for water ballast.

In small vessels (requiring navigation charts), where the cabin or saloon is the only space available for filing or use of such charts, one-half of the cabin or saloon, but not more than 3 tons, may be allowed for this purpose.

The allowance for boatswain's stores should not exceed 1 per cent of the gross tonnage in vessels of 1,000 tons gross and upward; but this allowance should not exceed 75 tons in any ship, however large. In vessels from 500 to 1,000 tons gross the reasonable limit is about 10 tons, and in vessels of 150 to 500 tons 2 per cent of the gross tonnage may be allowed. In vessels under 150 tons this allowance should not exceed 3 tons.

DONKEY ENGINE AND BOILER

ART. 32. (*a*) The space occupied by the donkey engine and boiler if situated within the boundary of the engine room or the casing above it, and if the said donkey engine is used in connection with the main machinery for propelling the vessel and forms part of the actual engine room should not be the subject of a separate allowance.

(*b*) When the donkey boiler is in a house above the upper deck and not connected with the main machinery as described above, it is

[21] See footnotes 18 and 19, art. 29.
[22] See footnotes, art. 29.

not subject to measurement in the gross tonnage of the ship, and therefore must not form a deduction.

(*c*) In all other cases the space occupied by the donkey engine [23] and boiler, if connected with the main pumps of the ship, is to be allowed as a deduction from the tonnage, if reasonable in extent and properly and efficiently constructed. It must be marked as other deducted spaces, showing the use to which it is to be put.

STORAGE OF SAILS

ART. 33. In the case of a vessel propelled wholly by sails, any space, not exceeding 2½ per cent of the gross tonnage, used exclusively for the storage of sails: *Provided*, That spaces deducted shall be certified by the collector to be reasonable in extent, properly and efficiently constructed for the purposes for which they are intended, and the words "Certified for storage of sails" to be cut on the beam and over the doorway of such space.

PROPELLING-POWER PERCENTAGES

ART. 34. In the case of a vessel propelled by steam or other power requiring engine room, a deduction for the space occupied by the propelling power shall be made as follows:

(*a*) In ships propelled by paddle wheels in which the tonnage of the space occupied by and necessary for the proper working of the boilers and machinery is above 20 per cent and under 30 per cent of the gross tonnage, the deduction shall be 37 per cent of the gross tonnage.

(*b*) In vessels propelled by screws in which the tonnage of the space is above 13 per cent and under 20 per cent of the gross tonnage, the deduction shall be 32 per cent of the gross tonnage.

(*c*) The shaft-trunk space shall be deemed necessary for the proper working of the machinery and considered a part of the propelling-power space.

(*d*) In the case of a paddle vessel in which the actual space occupied by the propelling machinery amounts to 20 per cent or under of her gross tonnage, the deduction shall consist of one and one-half times the tonnage of the actual machinery space.

(*e*) In the case of a screw vessel in which the propelling machinery space is 13 per cent or less of her gross tonnage, the deduction shall consist of one and three-fourths times the tonnage of the actual machinery space.

(*f*) But if the actual machinery space is so large as to amount in the case of paddle vessels to 30 per cent or above, and in the case of screw vessels to 20 per cent or above, of the gross tonnage of the vessel, the deduction shall consist of 37 per cent of the gross tonnage in the case of a paddle vessel and 32 per cent of the gross tonnage in the case of a screw vessel, or, if the owner prefers, there

[23] A pump room containing the pumps of the ship which are used solely for handling ballast, feed water, water for cleansing purposes, and for freeing the ship of water entering her hold, etc., will be treated as donkey-engine space. But a pump room containing pumps primarily used for handling cargo, as in the case of bulk-oil carriers, will not be so treated. The portion of it above deck is exemptible as machinery space, but the portion of it below deck will not be deducted as donkey engine, as it does not solely perform the office of one as indicated above.

shall be deducted from the gross tonnage of the vessel the tonnage of the space or spaces actually occupied by or required to be inclosed for the proper working of the boilers and machinery, including the shaft trunk or alley in screw steamers, with the addition in the case of vessels propelled with paddle wheels of 50 per cent and in the case of vessels propelled by screws of 75 per cent of the tonnage of such space.

SPACES ABOVE CROWN OF ENGINE ROOM

ART. 35. (*a*) On a request in writing to the Commissioner of Navigation by the owner of a vessel, the tonnage of such portion of the space or spaces above the crown of the engine room above the upper deck as is framed in for the machinery, or for the admission of light and air, and not required to be added to gross tonnage, shall, for the purpose of ascertaining the tonnage of the space occupied by the propelling power, be added to the engine space; but it shall then be included in the gross tonnage. Such space or spaces must be reasonable in extent, safe, and seaworthy and can not be used for any purpose other than the machinery or for the admission of light and air to the machinery or boilers of the vessel. To get this benefit the request must be accompanied with a description and sketch or tracing of the spaces, the measurement thereof, and the collector's certificate that such space or spaces conform to the requirements stated above.

(*b*) In construing the words "reasonable in extent" the measurer should note that the length should not exceed the length of the propelling space, and if any portion is plated over the length of the plated part should be deducted from the full length; and whatever the breadth of the casing may be, no greater breadth is to be allowed for the purpose of propelling space deduction than one-half the extreme inside breadth of the ship amidships.

The purpose of the addition of the framed-in light and air spaces (above the crown of the boiler and engine room and above the upper deck) of a vessel to her machinery space below the upper deck is to entitle her to a greater deduction for propelling power, and consequently a smaller net tonnage than she would otherwise obtain. To get this benefit, it does not always require the addition of the total of such light and air spaces. In such cases a portion only may be added.

Below is given a simple rule for finding the amount of light and air space or spaces required to be added to the gross tonnage and to the machinery space of a steam or other power screw vessel to entitle her to 32 per cent of her gross tonnage for propelling-power allowance when granted by the Commissioner of Navigation upon request of her owner or owners:

Find the difference between 13.1 per cent of her gross tonnage, inclusive of excess hatchways (based on her gross tonnage exclusive of light and air spaces and hatchways) and exclusive of light and air spaces, and the machinery space below the upper deck to the hull; then increase this difference by 15 per cent of itself. This difference so increased gives approximately the amount of light and air space or spaces required to be added to the gross tonnage defined above and to the machinery space below the upper deck to the hull. The gross

registered tonnage in such a case is the gross tonnage as defined above, plus the light and air addition, less one-half of 1 per cent of the said light and air addition (additional allowance for hatchways on account of light and air addition).

Example

Gross tonnage, exclusive of light and air and hatchways		5,675.95
Excess of hatchways (based on the above)		67.37
Gross tonnage, inclusive of excess hatchways and exclusive of light and air		5,743.32
13.1 per cent of 5,743.32	752.37	
Machinery space below the upper deck to the hull	680.55	
Difference	71.82	
15 per cent of difference	10.77	
Difference plus 15 per cent of itself (amount of light and air to be added to gross tonnage and machinery space)		82.59
Gross tonnage inclusive of light and air and excess of hatchways		5,825.91
Additional exemption for hatchways; account of light and air addition equals one-half of 1 per cent of 82.59=82.59/200		.41
Gross registered tonnage		5,825.50
Proof:		
13.1 per cent of 5,825.50		763.14
680.55 plus 82.59		763.14

MEASUREMENT OF ENGINE ROOM

ART. 36. Notwithstanding the ratable allowance for propelling power for which the act of March 2, 1895, provides, the measurers will observe that it will always be necessary to measure the engine room, whatever may be its size, in order to ascertain whether the allowance to be deducted for the propelling power is to be regulated by the general percentage prescribed by the act or by the actual contents of the engine room ascertained by measurement.

SPACES INCLUDED IN ENGINE ROOM

ART. 37. (*a*) By the space occupied by the engine room is to be understood that occupied by the engine room itself and the boiler room, together with the spaces strictly required for the working of the engines and boilers, and consists of the following items: (1) Space below the crown of the engine room, as defined below; (2) space between the crown and the upper deck framed in for the machinery or for the admission of light and air; (3) space similarly framed in above the upper deck when permitted under paragraph (*i*), act of March 2, 1895; and (4) the contents of the shaft trunk or trunks in screw vessels, including the trunked ladderway leading from the after part of the shaft trunk to the deck, provided that it is no larger than is necessary for the purpose of access to and escape from the shaft trunk.

(*b*) The crown or top of the main space of the actual engine room, from which the depth of the main space is to be taken, will either be

at the underside of a deck or, if the side bulkheads are curved, at the point or height at which the curve terminates.

(*c*) In the case of engine rooms of irregular form, the space is to be measured in parts with a view to obtaining the correct cubic contents.

(*d*) As a rule, the length of the engine room extends from the bulkhead forward of the boilers to the one aft of the engines; but if these bulkheads limit a space too great for the proper working of the boilers and engines, then that length only is to be measured which is requisite for containing the boilers and machinery, with the addition, when the fire grates are in a fore-and-aft direction, of such length as is necessary for the stoking or working of the fires in a fore-and-aft direction clear of the machinery or forward bulkhead. The additional length on this account may be about 1 foot more than the length of the fire grates. In any case where it may appear to the measurer that a greater length should be allowed he must submit all particulars, with plans, to the Commissioner of Navigation for consideration.

(*e*) No such additional length is, however, required when the boilers are placed with the fire grates athwartship, as in such a case the stoking or working of the fires in an athwartship direction does not interfere with the position of the engines or bulkhead. The clear central space allowed between the boilers when the stoking is athwartship should be sufficient for this purpose. The point to which the after boundary of the length of the engine room is to be measured should be no farther aft of the after cylinder or of its valve casing than is necessary for safe working, which is about 4 feet aft of such cylinder or valve casing. When it appears to the measurer that a greater length should be allowed, he must apply for instructions.

(*f*) Between the engines and boilers the measurer should allow such length as may appear to him necessary for the safe working of the machinery.

(*g*) The engine space between the crown of the main engine room and the upper deck, if any, is to be measured separately and its cubical contents added to the main space.

(*h*) In the case of a motor boat not having an engine room bulkheaded off from the rest of the hold, allow as engine space (basis for propelling-power allowance) the space occupied by the engine and sufficient space on each side of it—say, about 2 feet—to permit the operator to handle it safely and efficiently if there is sufficient space for such allowance; otherwise allow whatever space there is. Fuel tanks or storage batteries are not to be included in the said engine space. If the engine room is separated off from the rest of the hold by bulkheads and is larger than is strictly required for safe and efficient handling of the engine, limit the engine space according to the said requirements and as indicated in (*d*) above.

SHAFT TRUNKS

ART. 38. (*a*) When there is no built tunnel, the following rules should be observed in the case of a vessel with a single screw. The thrust-block space should be taken of such length and breadth as will admit of a man getting round it to remove the holding-down nut, and the height need not exceed 7 feet. The tunnel allowed should be of ordinary dimensions suitable for the vessel.

(*b*) When the vessel is a twin screw and the space aft of the engines is open from side to side, the space should not be included in the engine-room measurement for a greater height than 6 feet mean, and any space therein appropriated for stores or for any purpose other than the propelling power should be deducted from the space to be included in the engine room.

RULE FOR MEASUREMENT OF ENGINE SPACE

ART. 39. (*a*) When the propelling machinery (boilers and engine) space is in the hold amidship, measure the mean depth of the space from its crown to the ceiling, if any, at the limber strake; or, if there is no ceiling in the hold, to the top of the floors alongside the keelson; measure also three breadths of the space at the middle of its depth, taking one of those measurements at each end and another at the middle of the length; take the mean of those breadths; measure also the mean length of the space between the foremost and aftermost bulkheads, or limits of its length, excluding such parts, if any, as are not actually occupied by, or required for the proper working of, the machinery; multiply together these three dimensions of length, breadth, and depth, divide the product by 100, and the result shall be deemed the tonnage of the space below the crown; then find the cubical contents of the space or spaces, if any, above the crown aforesaid which are framed in for the machinery or for the admission of light and air, by multiplying together the length, depth, and breadth thereof; add such contents to the cubical contents of the space below the crown; divide the sum by 100, and the result shall (subject to the provisions hereinafter contained) be deemed to be the tonnage of the space.

(*b*) When this space is at the after end of the vessel and extends from side to side of the same and has a continuous bottom line, divide its length into such an even number of parts as will give a common interval between the points of division not in excess of 12 feet; then take a breadth at each end and one at each point of division at half height of the space, find the mean breadth and proceed as directed above.

(*c*) The boilers and engine may be considered to be in the same compartment where there is a transverse bulkhead (screen or otherwise) through which the boilers project into the engine space, and where there is only sufficient space between the boilers and engine for the safe working of the machinery.

(*d*) If the boilers and engine are entirely in separate rooms, or if there is a break or breaks in the bottom or side lines of the propelling machinery space resulting from a break or breaks in the double bottom or varying height of floors thereunder, or from side bunkers or other spaces not considered propelling machinery spaces, measure each room separately as a whole or in parts, according to the number of breaks in its bottom or side lines, according to the above rules, and the sum of their several results shall be deemed to be the tonnage of the said spaces.

(*e*) In the case of screw steamers in which the space for propelling power is to be measured and in which the top of the shaft trunk proper is flat, the contents of the said trunk shall be ascertained by multiplying together its mean length, breadth, and depth and dividing the product by 100. In like manner find the contents of the thrust block space or entrance to the shaft trunk. If the after part of the shaft space extends from side to side of the vessel, find its contents in the same manner as the contents of a peak tank or other deductible spaces so situated are found. (Figs. 22*c* and 22*d*.)

To find the contents of a shaft trunk proper with a round top, multiply the area of an average transverse section by the length of the trunk. When the top of the trunk is practically semicircular in shape, find the area of the transverse section in two parts, first the lower part from the bottom of the trunk up to where the curve begins by multiplying the breadth of the trunk by the said height and then the semicircular part at the top by taking half the area of a circle whose diameter is equal to the breadth of the trunk. The sum of the two parts will be the area of the section. (Fig. 22*e*.)

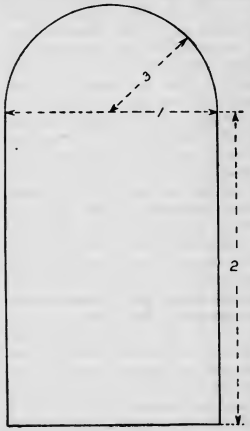


FIG. 22*e*.—1, breadth of lower part; 2, height of lower part; and 3, radius of semicircular top

DEDUCTIONS FROM ENGINE ROOM

ART. 40. The cubical contents of the engine space having been ascertained as described above, the cubical capacity of any cabins or storerooms which may be fitted in the engine room and solidly bulkheaded therefrom, and also any space occupied by machinery not used in propelling the ship, must be deducted,[24] and the remainder being divided by 100 will be the net tonnage of the actual engine room.

SPECIAL RULE FOR DREDGERS

ART. 41. The machinery spaces on the upper deck of dredgers towed from place to place requiring to be documented are to be exempted as in the case of other vessels, but no allowance for propelling power is to be made for such vessels on account of the machinery below deck that is used only for working the bucket or scoop and not for the propulsion of the vessel.

[24] Fuel-oil settling tanks, whose capacity do not exceed four days' supply when vessel is under full steam, within the confines of the engine room of an oil-burning vessel and used solely for rendering crude oil fit for consumption in the boiler furnaces are considered as parts of the machinery for propelling the vessel; and the spaces occupied by the same will be included in the actual machinery space taken as the basis for the allowance for propelling power. If such tanks are situated elsewhere, the matter must be referred to the Bureau of Navigation before final action in determining the amount of the propelling machinery is taken. Dynamo flats, storerooms for tools, bolts, piston rings, and small parts in daily use in the operation of the propelling machinery, workshops in daily use for making repairs upon the propelling machinery while in operation, etc., which are in the engine room below deck and which are open to the same, or separated therefrom only by a screen bulkhead may be considered as strictly required for the working of the boilers and engine, and as such retained in the engine room, provided they are reasonable in extent for the purposes to be served.

NET TONNAGE

ART. 42. (*a*) The tonnage of a vessel remaining after the authorized deductions have been made shall be deemed to be the net or register tonnage.

(*b*) In ascertaining the net tonnage, no space is to be deducted unless it has previously been included in the gross tonnage.

(*c*) A register ton shall be 100 cubic feet.

MISCELLANEOUS

FINAL RESULTS

ART. 43. (*a*) Measurements and calculations based upon them must be made carefully and accurately. Calculations must be verified at least twice and a diagram of areas for half breadths made. (Figs. 22*f* and 22*g*.)

(*b*) The measurements and calculations being complete and the tonnage duly marked on the main beam, the surveyor or measuring officer will certify the result to the collector, and such certificate form (Cat. 1322) will be preserved as a permanent record in the custom-house.

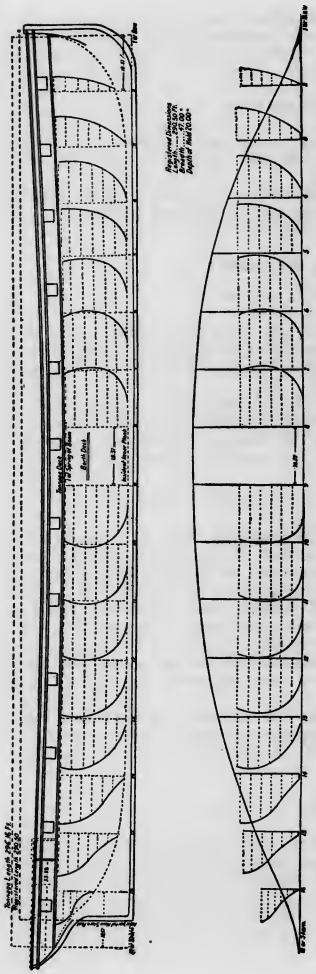
MARKING AND RECORDING OF TONNAGE

ART. 44. (*a*) The net tonnage (omitting fractions), together with the official number, must be marked on the face of the beam under the forward side of the main hatch of seagoing vessels and lake vessels, and on the face of the beam under the after side of the starboard forward hatch of western river steamers. On river steamers of the coast which carry passengers both above and below main deck where there is no hatch to the main deck the tonnage mark and official number should be made on one of the deck beams in a conspicuous place and as near as possible to the middle of the vessel.

(*b*) It should be in plain Arabic numerals not less than 3 inches high and not less than three-eighths inch deep in vessels whose main beam is wood, and plainly cut or punched on vessels whose main beam is of steel or iron.

CHANGE OF TONNAGE

ART. 45. The tonnage of any documented vessel of the United States expressed in her marine papers in pursuance of a measurement purporting to be in conformity to this rule can be changed or set aside only by permission of the Commissioner of Navigation. Accordingly, when changes in structure or use of spaces that affect the tonnage of such a vessel have been made since her former ad-



FIGS. 22f and 22g.—Register and tonnage lengths, areas of half breadths, and the curve of areas of round-stern vessels

measurement, and when for any reason the owner requests a change of tonnage, application must be made to the Commissioner of Navigation for permission to change her tonnage.

With each of such applications a precise statement of the proposed change of tonnage, whether it grows out of changes in the hull, deck erections, rig, use of spaces, deductions, etc., or errors in her former admeasurement, or changes in the regulations for the admeasurement of vessels subsequent thereto, must be submitted. This statement must be accompanied by a certificate of admeasurement for approval, with a detailed statement of the existing tonnage and appropriate blue prints or sketches for checking the proposed changes.

The figures of her former admeasurement as recorded on Catalogue 1410 will be accepted for the unaltered spaces and used as far as they are applicable in amending the tonnage of the altered spaces unless obvious errors are found in the same. If the vessel was originally admeasured at some other port than where the admeasurement for change of tonnage is to be made, her former figures may be secured from that port, to which they will be returned without alteration after they have served their purpose.

NEW DOCUMENTS ISSUE FROM READMEASUREMENTS

ART. 46. (*a*) Upon the application of the owner any vessel duly measured prior to April 1, 1895, may be remeasured in whole or in part to get the benefits of the deductions authorized under the act of March 2, 1895, and a new register, enrollment, or license issued.

APPENDIX FOR FOREIGN PORTS

ART. 47. Upon application by the master or owner of an American vessel in foreign trade collectors of customs, under regulations to be approved by the Secretary of Commerce, are authorized to attach to the register of such vessel an appendix stating separately for use in foreign ports the measurement of such space or spaces as are permitted to be exempted or deducted from gross tonnage by the rules of other nations and are not permitted by the laws of the United States, and vice versa.

MEASUREMENT OF GOVERNMENT VESSELS

ART. 48. The tonnage of Government colliers, transports, supply ships, repair ships, etc., shall be ascertained on request in accordance with these rules, but the following requirements will be waived: The marking of the ship's name and home port, official number (none required), and net tonnage; the requirements of size and conditions of crew space, and the certifications of deducted spaces on the beam over the doorway. The plate over the door designating its use is sufficient for such certifications.

FOREIGN VESSELS

ART. 49. A similar mode of measurement having been adopted by Great Britain, Belgium, Denmark, Italy, Sweden, Norway, Spain, the Netherlands, Russia, Finland, Portugal, Japan, France, Germany, and Free City of Danzig, and the like courtesy having been extended to vessels of the United States, it is directed that merchant vessels of those countries, the registers of which indicate their gross and net tonnage under their present laws, shall be taken in the ports of the United States to be of the tonnage so expressed in their documents. Vessels of foreign countries other than the aforesaid are to be measured according to the laws of the United States.

MEASURING INSTRUMENTS

ART. 50. (*a*) The measurements should be made with a waterproof tape, graduated into feet and tenths of a foot, and as nearly inelastic as possible.

(*b*) Sliding rods which are of three sizes: One 3 feet long for taking depths from 3 to 5.8 feet; another 6 feet long for taking depths from 6 to 11 feet, or, with the extension piece attached, to 16 feet; and a third one 11 feet long for taking depths from 11 to 21 feet, or, with the extension piece attached, to 26 feet. The movable or index rod in each has an arrow index traversing a decimal scale on

the fixed rod. Greater depths may be taken by inserting into the ends of the index rods, and extension piece, provided with sockets for this purpose one or more joints of lift rods described below:

The fixed rod is graduated in feet (in red) and tenths and half-tenths (in black), and when the ends of the rods are well together the arrow on the index rod points to the figure indicating the constant length of the fixed rod, and as the index rod is moved up the arrow indicates the length from the upper end thereof to the lower end of the fixed rod. Bear in mind, however, that when you use any of the attachments referred to above you must add to the reading on the fixed rod the net length of the attachment used; e. g., if the 6-foot rod is extended to its limit, 11 feet, which is reached when the arrow on the index rod is fair with the upper end of the fixed rod, and the extension piece is attached, which is done by slipping the bands on the lower end of it over the upper end of the index rod until the upper edge of the upper band is fair with the upper end of the index rod, and by fastening (on the groove side of the index rod) with set screws in the said bands, the length will not be 11 feet, as shown by the reading, but 16 feet, the reading plus the increment due to the attachment (11 feet+5 feet). This increment may be further increased by inserting into the end of the extension piece one or more joints of lift rods, each of which is about 3.95 feet when adjusted.

At the station of the area to be measured in single-deck vessels the rod is to be placed on the ceiling, or floor beam or timber when no ceiling is present, alongside the keelson or line of the keel, perpendicular or square thereto, and also parallel to the middle longitudinal plane of the ship, and forced up firmly under the deck and fixed in such position by the set screws; from the depths thus found take one-third of the round or one-half of the pitch of beam to get the depth of the area.

The depth of an area taken as above is to be divided into the required number of equal parts. (See art. 12.) With the rod fixed in position as above, set off on it from its lower end one of these equal parts, or common interval between the breadths, using white or other colored chalk or material that will make a visible mark, which gives the position of the first breadth above the bottom breadth, and from this when the rod is taken down the positions of the remaining breadths are to be set off at the said common interval.

The positions of all the breadths being thus severally marked on the rod, it is then to be set up again and firmly fixed or held in position, and the breadths may be readily and correctly measured by means of the tape held at right angles across the rod at each of the positions marked thereon.

In measuring vessels with more than one deck, where the second deck from the bottom is the tonnage deck, it will be necessary to use two of these rods in combination, one directly over the other, one in the hold under the first deck, as directed for single-deck vessels, and the other in the space between this deck and the tonnage deck. In this combination the tonnage depth is found by adding together the two depths and the thickness of the deck between the rods and deducting from this combined depth one-third of the round or one-half pitch of beam; then proceed as before directed.

(*c*) A 2-foot rule with a hinge joint is required for taking the rake of the bow and stern and for other purposes. (Figs. 9 and 10.)

(*d*) A carpenter's square will be found useful for setting the sliding rod perpendicular to the keelson.

(*e*) For taking the breadths in the hold which are beyond the reach of the measuring officers two lift rods will be needed, each about 8 feet long (made by joining two sections), one having a pulley at the end over which the tape may be drawn when the rods are held in position and the other an attachment for holding the ring at the end of the tape.

(*f*) For transferring the location of the stations or ordinates of the transverse sections from the deck to the keelson, and sometimes, for finding registered breadth, a plumb line and bob are needed.

(*g*) For measuring laden vessels for Panama or Suez Canal tonnage certificates, as provided for in the regulations, a girting galvanized chain of an approved make is required.

BLANKS

ART. 51. The following blanks are to be furnished the measuring officers: Memorandum of dimensions, etc. (Cat. 1413); Tonnage admeasurements (Cat. 1410); Certificate of admeasurement (Cat. 1414); Inspector's certificate (Cat. 1322); Notice of assignment of official number and signal letters (Cat. 1321); Master carpenter's certificate (Cats. 1261 and 1261a); and Application of owner for official number (Cat. 1320). The last two blanks to be given the builder and owner for execution.

PLANS AND DRAWINGS FOR MEASURERS

ART. 52. (*a*) The builder or owner of a steam vessel of over 100 gross tons, approximately, is requested, if practicable, in order to facilitate measurement, to furnish, a reasonable time before the vessel is launched, to the principal customs officer nearest to the place where the vessel is building, the following plans: (1) A drawing of the cross section in which is shown the construction of the double bottom, if there be one; (2) an inboard view of the longitudinal section, showing the double bottom, its use or uses, if one, otherwise the floors, the compartments for water ballast, other than the double bottom, the decks, the superstructures, hatchways, etc.; (3) deck plans showing the arrangement and uses of different compartments and deductible spaces; (4) drawings showing the arrangement of the engine, boiler, and fuel compartments; and (5) a tonnage plan showing half breadths of the sections at the points of division of the tonnage length of the vessel into a certain number of equal parts in accordance with the rules for the measurement of spaces under the tonnage deck. The scale or scales of these drawings are to be indicated thereon.

(*b*) The collector of customs is to be advised of any subsequent changes in the vessel and furnished copies of the corrected plans, or a statement of such changes.

(*c*) Builders or owners of smaller vessels will notify the principal customs officer nearest to the place where the vessel is building

when the hold may be measured before cabins or other compartments are built in or the machinery installed. The measurers should be allowed access to such plans as will aid their work.

TABLES

For finding the decimal equivalent of inches and for converting tons into cubic meters, and vice versa, the following tables will be found useful:

DECIMAL EQUIVALENT OF INCHES

One foot, or 12 inches, the integer			
Inches	Equivalents in decimals of a foot	Inches	Equivalents in decimals of a foot
11	0.92	4	0.33
10	.83	3	.25
9	.75	2	.17
8	.67	1	.08
7	.58	¾	.06
6	.50	½	.04
5	.42	¼	.02

REDUCTION OF TONS TO CUBIC METERS

Tons	Meters	Tons	Meters	Tons	Meters	Tons	Meters
1	2.83	26	73.58	51	144.33	76	215.08
2	5.66	27	76.41	52	147.16	77	217.91
3	8.49	28	79.24	53	149.99	78	220.74
4	11.32	29	82.07	54	152.82	79	223.57
5	14.15	30	84.90	55	155.65	80	226.40
6	16.98	31	87.73	56	158.48	81	229.23
7	19.81	32	90.56	57	161.31	82	232.06
8	22.64	33	93.39	58	164.14	83	234.89
9	25.47	34	96.22	59	166.97	84	237.72
10	28.30	35	99.05	60	169.80	85	240.55
11	31.13	36	101.88	61	172.63	86	243.38
12	33.96	37	104.71	62	175.46	87	246.21
13	36.79	38	107.54	63	178.29	88	249.04
14	39.62	39	110.37	64	181.12	89	251.87
15	42.45	40	113.20	65	183.95	90	254.70
16	45.28	41	116.03	66	186.78	91	257.53
17	48.11	42	118.86	67	189.61	92	260.36
18	50.94	43	121.69	68	192.44	93	263.19
19	53.77	44	124.52	69	195.27	94	266.02
20	56.60	45	127.35	70	198.10	95	268.85
21	59.43	46	130.18	71	200.93	96	271.68
22	62.26	47	133.01	72	203.76	97	274.51
23	65.09	48	135.84	73	206.59	98	277.34
24	67.92	49	138.67	74	209.42	99	280.17
25	70.75	50	141.50	75	212.25	100	283.00

To reduce cubic meters to tons divide the number of cubic meters in question by 2.83, or multiply it by the factor 0.353.

DEFINITION OF INCLOSURES ABOVE DECK

Forecastle.—An erection upon the upper deck of a vessel, extending from side to side from the stem toward aft.

Bridge.—A decked erection usually from 6 to 8 feet in height and of undefined length, fitted about amidships and extending from side to side over the upper deck of a vessel.

Break.—A break is the space above the line of the under side of the upper deck when that deck is cut off and continued at a higher elevation. The height of a break is the distance from the said line to the under side of the break deck. The break in the deck is caused usually by a sunk forecastle, a sunk poop, or raised quarter-deck, etc.

Poop.—A structure on the extreme after end of a weather deck extending from side to side of a vessel.

Roundhouse.—An erection from 6 to 8 feet in height on or above the upper deck but not extending from side to side of the vessel, as is the case with a bridge, a forecastle, a poop, or raised quarter-deck. For descriptive purposes on vessel documents, spaces not extending from side to side of the vessel, of less height, such as cabin heads or trunks, and closed-in spaces over the holds of motor boats, etc., may be classed as roundhouses.

Side house.—A small house at the side of the upper, forecastle, bridge, or poop deck, etc., of a vessel.

Chart house.—A small structure of iron, steel, or wood, about 7 feet in height on a bridge or weather deck of a steamer; where the charts are kept, and where the master usually stays when not on duty while navigating in narrow waters.

Radio house.—A structure on the weather deck of a vessel or on a superstructure thereon, in which is installed the wireless apparatus and in which is provided accommodation for the operator when on or off duty.

Excess hatchways.—The difference between the total of the spaces within the hatchways of a vessel and one-half of 1 per cent of her gross tonnage exclusive of hatchways.

Light and air spaces.—The portion of the spaces within the casings around the boiler and engine hatches and above the upper deck to the hull of a steamer for machinery or for admission of light and air to her boilers or machinery below.

DEFINITION OF ITEMS OF DEDUCTION

Crew spaces.—The space appropriated exclusively to the use of the crew of a vessel, except such spaces as the engineer shop, carpenter shop, plumber shop, butcher shop, etc., wherever situated, and the dynamo room below deck. The total of all crew-space deductions will be shown on vessel documents under the head of "crew space."

Master's cabin.—A space for the exclusive use of the master, and consists of his sleeping room, bathroom, dressing room, office, and passageways serving his accommodations. But the room in the same apartment with these generally used as a dining saloon for himself and officers will not be considered deductible as a part of the master's cabin but as a part of the "crew space."

Steering gear.—The space below deck occupied by machinery, fittings, etc., for working the helm of a vessel.

Anchor gear.—The space below deck occupied by chains or cables, machinery, etc., for handling the anchor.

Boatswain's stores.—The spaces for storing paints, oils, blocks, hawsers, rigging, deck gear, etc., in charge of the boatswain and for daily use on the vessel.

Chart house.—See same above.

Donkey engine and boiler.—The space below deck occupied by an auxiliary engine in connection with the main pumps of a vessel, or in connection with her main machinery.

Radio house.—See same above.

Storage of sails.—The space in a vessel propelled wholly by sails used exclusively for storing the same, subject to the limitation of 2½ per cent of the vessel's gross tonnage.

Propelling power.—The deduction for machinery and fuel spaces in powered vessels, such as those propelled by steam, gas, etc.

DEFINITION OF STRUCTURAL TERMS, ETC.

Stem.—In the case of wooden vessels, it is the heavy curved piece of timber which terminates the fore end of the ship's hull. Its lower end is connected to the fore end of the keel, its upper end extending up to (and usually forming a bed for) the bowsprit. In iron or steel vessels it is the heavy piece of iron or steel extending in one length from the keel to above the upper (or forecastle) deck, and forming the extreme fore end of a ship.

Sternpost (main).—In wooden vessels, the piece of timber extending from the after end of the keel to the uppermost deck and to which the rudder braces are fixed to receive the pintles by which the rudder is hung. In iron or steel sailing vessels, paddle and twin-screw steamers, the heavy forging or casting of iron or steel extending from the after end of the keel (to which it is scarfed) to the upper or poop deck; in single-screw steamers, the after part of the stern frame.

Rudderpost.—See "Sternpost."

Length over all.—The length of the hull of a vessel from the forward part of the stem to the aftermost point of the stern, whether above or below the water line.

Beam.—See "Breadth of beam," article 5. Also a strong piece of timber, heavy angle bar, or a combination of angle bars, bulb bars, etc., spanning the hull of a vessel or a superstructure from side to side.

Molded breadth.—Breadth from outside to outside of frames at the widest part of a vessel; that is, exclusive of the outside plating or planking.

Ceiling.—Planking covering the inside of a vessel's frames.

Keelson.—In wooden vessels the keelson is composed (like the keel) of various pieces of timber connected endwise and placed on the floors just over the keel and extending all fore and aft. In iron or steel ships the middle-line keelson is the principal keelson at the center line, right over the keel.

Keel.—The so-called backbone of a vessel. In wooden and composite vessels it is composed of pieces of timber of as great length as can be obtained, which are connected to each other by scarfs. In iron or steel vessels it consists generally of long bars, connected by vertical scarfs, or of plates fitted horizontally at the middle line under the floors and connected to each other by butt straps.

Sheer.—The curve formed by the line of a vessel's upper deck at the sides; that is, the fore-and-aft curvature of the deck.

Stern or horn timber.—The aftermost upper frame of a vessel at the stern.

Stern.—The after end of a vessel.

Rake of the bow.—The inclination of the line of the inner face of the stem from the perpendicular erected at the forward end of the keel.

Rake of the stern timber.—Its (stern timber) inclination from the perpendicular at the after end of the keel.

Round and pitch of beam.—See articles 10 (*b*) and 11 (*b*).

Deck hook.—A wooden hook in the range of deck beams on which the extreme fore ends of deck planks rest and to which they are fastened. In iron or steel vessels, a hook connecting the extreme fore ends of deck stringer plates.

Bow.—Fore end of a vessel.

Break in double bottom.—The point where the line of the inner bottom is broken and carried on at a higher elevation.

Double bottom.—The space at the bottom of a ship between the inner and outer bottoms used for storage of water ballast, feed water, fuel oil, etc.

Floor or floor timber.—The lowermost of the various pieces of timber of which a body frame of a vessel is constructed and which lies across the keel. In an iron or steel vessel a plate placed vertically in the bottom, extending from bilge to bilge, usually in way of each frame, to which it (the frame) is connected. In double bottoms of the usual construction it extends from the outer to the inner bottom thereof.

Limber strake.—The strake of the bottom ceiling next to the keelson.

Limbers or watercourse.—In wooden vessels, gutters or channels upon the floors, one on each side of the keelson; also the holes cut in the under part of the floors. In composite, iron, and steel ships the various ranges of apertures in the lower portion of the floors; all serving to allow a passage toward the pumps for water accumulating between the floors.

Batten.—A board or iron bar several inches in breadth, sometimes used in holds of vessels instead of ceiling.

Frame.—One of the numerous transversal (longitudinal in Isherwood-built vessels) ribs that form the skeleton of a vessel.

Web frame.—Web frames consist of strong plates fitted transversally to the frames to which they are riveted. They are placed at intervals, say, one to every fifth, eighth, tenth, or twelfth frame, as the case may be, having their inner edge strengthened (usually) by double reversed angle bars and extend from one deck to another or from a deck or hold beams down to the bilge.

Shell plating.—The plating forming the outer skin of the hull.

Molded depth.—The depth measured amidships from the top of the keel to the top of the upper-deck beam, less the round of beam. In shelter and awning decked vessels it is the depth so measured to the deck next below the shelter or awning deck.

Spar deck.—The upper deck in a spar-deck ship.

Spar-deck ship.—Spar-deck ships have three or more decks, the upper being lighter in construction than the others.

Between decks.—Between decks is the space between any two decks. For measurement purposes it is the space between the second and

third and third and fourth decks, etc., the decks being numbered from below.

Hatchway.—A square aperture in a ship's deck through which cargo is laden or discharged, engines and boilers shipped and unshipped, etc.; in common practice the term "hatch" is also applied.

Cabin.—An apartment usually containing smaller rooms in the sides furnished for dwelling in by the master and officers, and in large ships also affording sleeping accommodation for passengers.

Stateroom.—A place for lodging in a ship's cabin; a passenger's room.

Stiffener.—An angle bar, T-bar, channel bar, etc., used to stiffen plating of the bulkhead, etc.

Bulkhead.—Bulkheads are partitions by which compartments, rooms, etc., in a vessel are formed, or the hold of a ship divided.

Freeing port.—An opening in the bulwark or shell plating between the shelter and upper decks for discharging large quantities of water when thrown by the sea upon the ship's deck.

Scupper.—A round or oval aperture serving to lead off small quantities of water, preventing its accumulation on a vessel's deck.

Shaft trunk.—A water-tight structure from about 4 to 7 feet in height and somewhat less in breadth, according to the size of the vessel, fitted at the middle line upon the floors in small and middle size steamers, but elevated upon supports from 3 to 8 feet above the floors in very large ships; extending from the engine room after bulkhead to the stuffing-box bulkhead. It incloses the screw shafting, to which access is obtained through a water-tight door in the engine-room bulkhead.

RÉSUMÉ OF EXEMPTIBLE SPACES

Peak and other tanks for water ballast.
Open forecastle.
Open bridge.
Open poop.
Anchor gear.
Steering gear.
Donkey engine and boiler.
Light and air when not requested to be added to machinery space below deck.
Wheelhouse.
Galley.
Condenser.
Water-closets.
Domes.
Skylights.
Companions, except portions used for smoking rooms.
Cabins for passengers, when on decks not to the hull, such as shelter, forecastle, bridge, and poop decks.
Light and air trunks serving other than machinery spaces.

These spaces to be exempt, except the fore peak and aft peak, must be on or above the upper deck to the hull.

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Part II.—LAWS OF THE UNITED STATES RELATING TO THE MEASUREMENT OF VESSELS.

The Commissioner of Navigation shall be charged with the supervision of the laws relating to the admeasurement of vessels, and the assigning of signal letters thereto, and of designating their official number; and on all questions of interpretation growing out of the execution of the laws relating to these subjects, and relating to the collection of tonnage tax, and to the refund of such tax when collected erroneously or illegally, his decision shall be final July 5, 1884. Sec. 3.

MEASUREMENT.

Before any vessel shall be registered, she shall be measured by a surveyor, if there be one, or by the person he shall appoint, at the port or place where the vessel may be, and if there be none, by such person as the collector of the district within which she may be shall appoint. But in all cases where a vessel has before been registered as a vessel of the United States, it shall not be necessary to measure her anew, for the purpose of obtaining another register; unless such vessel has undergone some alteration as to her burden, subsequent to the time of her former registry. R. S., 4148.

The officer or person by whom such measurement is made shall, for the information of and as a voucher to the officer by whom the registry is to be made, grant a certificate, specifying the build of the vessel, her number of decks and masts, her length, breadth, depth, the number of tons she measures, and such other particulars as are usually descriptive of the identity of a vessel, and that her name, and the place to which she belongs, are painted on her stern in manner required by this Title [R. S., 4131–4305]; which certificate shall be countersigned by an owner, or by the master of such vessel, or by some other person who shall attend her admeasurement, on behalf of her owner or owners, in testimony of the truth of the particulars therein contained; without which the certificate shall not be valid. R. S., 4149.

The registry of every vessel shall express her length and breadth, together with her depth and the height under the third or spar deck, which shall be ascertained in the following manner: The tonnage deck, in vessels having three or more decks to the hull, shall be the second deck from below; in all other cases the upper deck of the hull is to be the tonnage-deck. The length from the fore part of the outer planking on the side of the stem to the after part of the main stern-post of screw-steamers, and to the R. S., 4150

after part of the rudder-post of all other vessels measured on the top of the tonnage-deck, shall be accounted the vessel's length. The breadth of the broadest part on the outside of the vessel shall be accounted the vessel's breadth of beam. A measure from the under side of the tonnage-deck plank, amidships, to the ceiling of the hold, (average thickness,) shall be accounted the depth of hold. If the vessel has a third deck, then the height from the top of the tonnage-deck plank to the under side of the upper-deck plank shall be accounted as the height under the spar-deck. All measurement to be taken in feet and fractions of feet; and all fractions of feet shall be expressed in decimals.

R. S., 4151. No part of any vessel shall be required by the preceding section to be measured or registered for tonnage that is used for cabins or state-rooms, and constructed entirely above the first deck, which is not a deck to the hull.

GROSS TONNAGE.

R. S., 4153 The register tonnage of every vessel built within the United States or owned by a citizen or citizens thereof shall be her entire internal cubical capacity in tons of one hundred cubic feet each, to be ascertained as follows: Measure the length of the vessel in a straight line along the upper side of the tonnage-deck, from the inside of the inner plank, average thickness, at the side of the stem to the inside of the plank on the stern-timbers, average thickness, deducting from this length what is due to the rake of the bow in the thickness of the deck, and what is due to the rake of the stern-timber in the thickness of the deck, and also what is due to the rake of the stern-timber in one-third of the round of the beam; divide the length so taken into the number of equal parts required by the following table, according to the class in such table to which the vessel belongs:

Class one. Vessels of which the tonnage length according to the above measurement is fifty feet or under: into six equal parts.

Class two. Vessels of which the tonnage length according to the above measurement is above fifty feet and not exceeding one hundred feet: into eight equal parts.

Class three. Vessels of which the tonnage length according to the above measurement is above one hundred feet, and not exceeding one hundred and fifty feet: into ten equal parts.

Class four. Vessels of which the tonnage length according to the above measurement is above one hundred and fifty feet, and not exceeding two hundred feet: into twelve equal parts.

Class five. Vessels of which the tonnage length according to the above measurement is above two hundred feet, and not exceeding two hundred and fifty feet: into fourteen equal parts.

Class six. Vessels of which the tonnage length according to the above measurement is above two hundred and fifty feet: into sixteen equal parts.

Then, the hold being sufficiently cleared to admit of the required depths and breadths being properly taken, find the transverse area of such vessel at each point of division of the length as follows:

Measure the depth at each point of division from a point at a distance of one-third of the round of the beam below such deck; or, in case of a break, below a line stretched in continuation thereof, to the upper side of the floor-timber, at the inside of the limber-strake, after deducting the average thickness of the ceiling, which is between the bilge-planks and limber-strake; then, if the depth at the midship division of the length do not exceed sixteen feet, divide each depth into four equal parts; then measure the inside horizontal breadth, at each of the three points of division, and also at the upper and lower points of the depth, extending each measurement to the average thickness of that part of the ceiling which is between the points of measurement; number these breadths from above, numbering the upper breath one, and so on down to the lowest breadth; multiply the second and fourth by four, and the third by two; add these products together, and to the sum add the first breadth and the last, or fifth; multiply the quantity thus obtained by one-third of the common interval between the breadths, and the product shall be deemed the transverse area; but if the midship depth exceed sixteen feet, divide each depth into six equal parts, instead of four, and measure as before directed, the horizontal breadths at the five points of division, and also at the upper and lower points of the depth; number them from above as before; multiply the second, fourth, and sixth by four, and the third and fifth by two; add these products together, and to the sum add the first breadth and the last, or seventh; multiply the quantities thus obtained by one-third of the common interval between the breadths, and the product shall be deemed the transverse area.

Having thus ascertained the transverse area at each point of division of the length of the vessel, as required above, proceed to ascertain the register tonnage of the vessel in the following manner:

Number the areas successively one, two, three, and so forth, number one being at the extreme limit of the length at the bow, and the last number at the extreme limit of the length at the stern; then, whether the length be divided according to the table into six or sixteen parts, as in classes one and six, or any intermediate number, as in classes two, three, four, and five, multiply the second, and every even-numbered area by four, and the third, and every odd-numbered area, except the first and last, by two; add these products together, and to the sum add the

first and last if they yield anything; multiply the quantities thus obtained by one-third of the common interval between the areas, and the product will be the cubical contents of the space under the tonnage-deck; divide this product by one hundred, and the quotient, being the tonnage under the tonnage-deck, shall be deemed to be the register tonnage of the vessel subject to the additions hereinafter mentioned.

DECK HOUSES, BREAKS, ETC.

R. S., 4153. Mar. 2, 1895. Sec. 1 (h).

If there be a break, a poop, or any other permanent closed-in space on the upper deck, available for cargo, or stores, or for the berthing or accommodation of passengers or crew, the tonnage of that space shall be ascertained as follows and added to the gross tonnage:

Measure the internal mean length of such space in feet, and divide it into an even number of equal parts of which the distance asunder shall be most nearly equal to those into which the length of the tonnage-deck has been divided; measure at the middle of its height the inside breadths; namely, one at each end and at each of the points of division, numbering them successively one, two, three, and so forth; then to the sum of the end breadths add four times the sum of the even-numbered breadths and twice the sum of the odd-numbered breadths, except the first and last, and multiply the whole sum by one-third of the common interval between the breadths; the product will give the mean horizontal area of such space; then measure the mean height between the planks of the decks, and multiply by it the mean horizontal area; divide the product by one hundred, and the quotient shall be deemed to be the tonnage of such space, and shall be added to the tonnage under the tonnage-decks, ascertained as aforesaid: *Provided*, That nothing shall be added to the gross tonnage for any sheltered space above the upper deck which is under cover and open to the weather; that is, not inclosed.

HATCHWAYS.

Feb. 6, 1909.

The cubical contents of the hatchways shall be obtained by multiplying the length and breadth together and the product by the mean depth taken from the top of beam to the under side of the hatch. From the aggregate tonnage of the hatchways there shall be deducted one-half of one per cent of the gross tonnage and the remainder only shall be added to the gross tonnage of the ship exclusive of the tonnage of the hatchways.

BETWEEN DECKS.

R. S., 4153.

If a vessel has a third deck, or spar deck, the tonnage of the space between it and the tonnage-deck shall be ascertained as follows:

Measure in feet the inside length of the space, at the middle of its height, from the plank at the side of the stem to the plank on the timbers at the stern, and divide the length into the same number of equal parts into which the length of the tonnage-deck is divided; measure, also at the middle of its height, the inside breadth of the space at each of the points of division, also the breadth of the stem and the breadth at the stern; number them successively one, two, three, and so forth, commencing at the stem; multiply the second, and all other even-numbered breadths, by four, and the third, and all the other odd-numbered breadths, except the first and last, by two; to the sum of these products add the first and last breadths, multiply the whole sum by one-third of the common interval between the breadths, and the result will give, in superficial feet, the mean horizontal area of such space; measure the mean height between the plank of the two decks, and multiply by it the mean horizontal area, and the product will be the cubical contents of the space; divide this product by one hundred, and the quotient shall be deemed to be the tonnage of such space, and shall be added to the other tonnage of the vessel ascertained as above directed. And if the vessel has more than three decks, the tonnage of each space between decks, above the tonnage-deck, shall be severally ascertained in the manner above described, and shall be added to the tonnage of the vessel, ascertained as above directed.

OPEN VESSELS.

R. S., 4153.

In ascertaining the tonnage of open vessels the upper edge of the upper strake is to form the boundary-line of measurement, and the depth shall be taken from an athwartship line, extending from the upper edge of such strake at each division of the length.

WATER BALLAST.

Mar. 2, 1895.

In the case of a ship constructed with a double bottom for water ballast, if the space between the inner and outer plating thereof is certified by the collector to be not available for the carriage of cargo, stores, or fuel, then the depth of the vessel shall be taken to be the upper side of the inner plating of the double bottom, and that upper side shall for the purposes of measurement be deemed to represent the floor timber. From the gross tonnage there shall be deducted any other space adapted only for water ballast certified by the collector not to be available for the carriage of cargo, stores, supplies, or fuel.

Feb. 6, 1909. Sec. 2.

NET TONNAGE.

Aug. 5, 1882

From the gross tonnage of every vessel of the United States there shall be deducted—

CREW ACCOMMODATIONS.

Mar. 2, 1895.

(a) The tonnage of the spaces or compartments occupied by or appropriated to the use of the crew of the vessel. Every place appropriated to the crew of the vessel shall have a space of not less than seventy-two cubic feet and not less than twelve superficial feet, measured on the deck or floor of that place, for each seaman or apprentice lodged therein. The provisions of this Act requiring a crew space of seventy-two cubic feet per man shall apply only to vessels the construction of which shall be begun after June thirtieth, eighteen hundred and ninety-five. Such place shall be securely constructed, properly lighted, drained, and ventilated, properly protected from weather and sea, and as far as practicable properly shut off and protected from the effluvium of cargo or bilge water; and failure to comply with this provision shall subject the owner to a penalty of five hundred dollars. Every place so occupied shall be kept free from goods or stores of any kind not being the personal property of the crew in use during the voyage; and if any such place is not so kept free the master shall forfeit and pay to each seaman or apprentice lodged in that place the sum of fifty cents a day for each day during which any goods or stores as aforesaid are kept or stored in the place after complaint has been made to him by any two or more of the seamen so lodged. No deduction from tonnage as aforesaid shall be made unless there is permanently cut in a beam and over the doorway of every such place the number of men it is allowed to accommodate with these words, "certified to accommodate —— seamen."

Mar. 4, 1915. Sec. 6.

That on all merchant vessels of the United States the construction of which shall be begun after the passage of this Act, except yachts, pilot boats, or vessels of less than one hundred tons register, every place appropriated to the crew of the vessel shall have a space of not less than one hundred and twenty cubic feet and not less than sixteen square feet, measured on the floor or deck of that place, for each seaman or apprentice lodged therein, and each seaman shall have a separate berth and not more than one berth shall be placed one above another; such place or lodging shall be securely constructed, properly lighted, drained, heated, and ventilated, properly protected from weather and sea, and, as far as practicable, properly shut off and protected from the effluvium of cargo or bilge water. And every such crew space shall be kept free from goods or stores not being the personal property of the crew occupying said place in use during the voyage.

That in addition to the space allotment for lodgings hereinbefore provided, on all merchant vessels of the United States which in the ordinary course of their trade make voyages of more than three days' duration between ports, and which carry a crew of twelve or more seamen, there shall be constructed a compartment, suitably separated from other spaces, for hospital purposes, and such compartment shall have at least one bunk for every twelve seamen, constituting her crew, provided that not more than six bunks shall be required in any case.

Every steamboat of the United States plying upon the Mississippi River or its tributaries shall furnish an appropriate place for the crew, which shall conform to the requirements of this section, so far as they are applicable thereto, by providing sleeping room in the engine room of such steamboat, properly protected from the cold, wind, and rain by means of suitable awnings or screens on either side of the guards or sides and forward, reaching from the boiler deck to the lower or main deck, under the direction and approval of the Supervising Inspector General of Steam Vessels, and shall be properly heated.

All merchant vessels of the United States, the construction of which shall be begun after the passage of this act having more than ten men on deck must have at least one light, clean, and properly ventilated washing place. There shall be provided at least one washing outfit for every two men of the watch. The washing place shall be properly heated. A separate washing place shall be provided for the fireroom and engine-room men, if their number exceed ten, which shall be large enough to accommodate at least one-sixth of them at the same time, and have hot and cold water supply and a sufficient number of wash basins, sinks, and shower baths.

Any failure to comply with this section shall subject the owner or owners of such vessel to a penalty of not less than $50 nor more than $500: *Provided*, That forecastles shall be fumigated at such intervals as may be provided by regulations to be issued by the Surgeon General of the Public Health Service, with the approval of the Department of Commerce, and shall have at least two exits, one of which may be used in emergencies.

DEDUCTIONS FOR OTHER PURPOSES.

(b) Any space exclusively for the use of the master certified by the collector to be reasonable in extent and properly constructed, and the words "Certified for the accommodation of master" to be permanently cut in a beam and over the door of such space. Mar. 2, 1895.

(c) Any space used exclusively for the working of the helm, the capstan, and the anchor gear, or for keeping the charts, signals, and other instruments of navigation and boatswain's stores, and the words "Certified for steering gear," or "Certified for boatswain's stores," or "Certified chart house," as the case may be, to be permanently cut in the beam and over the doorway of each of such spaces.

(d) The space occupied by the donkey engine and boiler, if connected with the main pumps of the ship.

(e) In the case of a ship propelled wholly by sails any space, not exceeding two and one-half per centum of the gross tonnage, used exclusively for storage of sails: *Provided*, That spaces deducted shall be certified by the collector to be reasonable in extent and properly and efficiently constructed for the purposes for which they are intended, and the words "Certified for storage of sails" to be cut on the beam and over the doorway of such space.

DEDUCTIONS FOR PROPELLING POWER.

Mar. 2, 1895.

(f) In the case of a ship propelled by steam or other power requiring engine room, a deduction for the space occupied by the propelling power shall be made, as follows:

In ships propelled by paddle wheels in which the tonnage of the space occupied by and necessary for the proper working of the boilers and machinery is above twenty per centum and under thirty per centum of the gross tonnage, the deduction shall be thirty-seven per centum of the gross tonnage; and in ships propelled by screws in which the tonnage of the space is above thirteen per centum and under twenty per centum of the gross tonnage, the deduction shall be thirty-two per centum of the gross tonnage. In the case of screw steamers the contents of the trunk shaft shall be deemed spaces necessary for the proper working of the machinery.

(g) In the case of other vessels in which the actual space occupied by the propelling machinery amounts in the case of paddle vessels to twenty per centum or under and in the case of screw vessels to thirteen per centum or under of the gross tonnage of the ship, the deduction shall consist in the case of paddle vessels of once and a half the tonnage of the actual machinery space and in the case of screw vessels of once and three-fourths the tonnage of the actual machinery space. But if the actual machinery space is so large as to amount in the case of paddle vessels to thirty per centum or above, and in the case of screw vessels to twenty per centum or above of the gross tonnage of the ship, the deduction shall consist of thirty-seven per centum of the gross tonnage of the ship in the case of a paddle vessel and thirty-two per centum of the gross tonnage in the case of a screw vessel; or if the owner prefers there shall be deducted from the gross tonnage of the vessel the tonnage of the space or spaces actually occupied by or required to be inclosed for the proper working of the boilers and machinery, including the trunk shaft or alley in screw steamers, with the addition in the case of vessels propelled with paddle wheels of fifty per centum, and in the case of vessels propelled by screws of seventy-five per centum of the tonnage of such space.

(i) On a request in writing to the Commissioner of Navigation by the owners of a ship the tonnage of such portion of the space or spaces above the crown of the engine room and above the upper deck as is framed in for the machinery or for the admission of light and air and not required to be added to gross tonnage shall, for the purpose of ascertaining the tonnage of the space occupied by the propelling power, be added to the tonnage of the engine space; but it shall then be included in the gross tonnage; such space or spaces must be reasonable in extent, safe, and seaworthy, and can not be used for any purpose other than the machinery or for the admission of light and air to the machinery or boilers of the ship.

REGISTER TONNAGE.

And the proper deduction from the gross tonnage having been made, the remainder shall be deemed the net or register tonnage of such vessels. Aug. 5, 1882

The register of the vessel shall express the number of decks, the tonnage under the tonnage-deck, that of the between-decks, above the tonnage-deck; also that of the poop or other inclosed spaces above the deck, each separately. R. S., 4153.

The register or other official certificate of the tonnage or nationality of a vessel of the United States, in addition to what is now required by law to be expressed therein, shall state separately the deductions made from the gross tonnage, and shall also state the net or register tonnage of the vessel. Aug. 5, 1882.

But the outstanding registers or enrollments of vessels of the United States shall not be rendered void by the addition of such new statement of her tonnage, unless voluntarily surrendered; but the same may be added to the outstanding document or by an appendix thereto, with a certificate of a collector of customs that the original estimate of tonnage is amended.

In every vessel documented as a vessel of the United States the number denoting her net tonnage shall be deeply carved or otherwise permanently marked on her main beam, and shall be so continued; and if the number at any time cease to be continued such vessel shall be subject to a fine of thirty dollars on every arrival in a port of the United States if she have not her tonnage number legally carved or permanently marked. R. S., 4153. June 19, 1886 Sec. 5.

Under the direction of the Secretary of Commerce the Commissioner of Navigation shall make regulations needful to give effect to the provisions of this Act. The Secretary of Commerce shall establish and promulgate a proper scale of fees to be paid for the readmeasurement of the spaces to be deducted from the gross tonnage of a vessel, on the basis of the last sentence of section forty-one hundred and eighty-six of the Revised Statutes, beginning with the words "But the charge for the measurement." Mar. 2, 1895. Sec. 4. Feb. 14, 1903. Sec. 10. Aug. 5, 1882. Sec. 3.

APPENDIX OF MEASUREMENT.

Mar. 2, 1895.
Feb. 14, 1903. Sec. 10.

Upon application by the owner or master of an American vessel in foreign trade, collectors of customs, under regulations to be approved by the Secretary of Commerce, are authorized to attach to the register of such vessel an appendix stating separately, for use in foreign ports, the measurement of such space or spaces as are permitted to be deducted from gross tonnage by the rules of other nations and are not permitted by the laws of the United States.

Mar. 2, 1895. Sec. 2.

This Act shall not be construed to require the remeasurement of any American vessel duly measured before April first, eighteen hundred and ninety-five; but upon application by the owner of any such vessel collectors of customs shall cause such vessel, or the spaces to be deducted, to be measured according to the provisions of this Act, and if a new register is not issued the statement of such remeasurement shall be attached by an appendix to the outstanding register or enrollment with a certificate of the collector of customs that the original estimate of tonnage is amended pursuant to this Act.

VESSELS EXEMPT FROM MEASUREMENT.

R. S., 4152.

The provisions foregoing relating to the measurement of vessels shall not be deemed to apply to any vessel not required by law to be registered, or enrolled, or licensed, unless otherwise specially provided.

MEASUREMENT OF FOREIGN VESSELS.

R. S., 4154. Aug. 5, 1882. Sec. 2. Feb. 14, 1903. Sec. 10.

Whenever it is made to appear to the Secretary of Commerce that the rules concerning the measurement for tonnage of vessels of the United States have been substantially adopted by the government of any foreign country, he may direct that the vessels of such foreign country be deemed to be of the tonnage denoted in their certificates of register or other national papers, and thereupon it shall not be necessary for such vessels to be remeasured at any port in the United States; and when it shall be necessary to ascertain the tonnage of any vessel not a vessel of the United States, the said tonnage shall be ascertained in the manner provided by law for the measurement of vessels of the United States.

EXEMPTION FROM MEASUREMENT.

Aug. 18, 1914. Sec. 2.

The President of the United States is hereby authorized, whenever in his discretion the needs of foreign commerce may require, to suspend by order, so far and for such length of time as he may deem desirable, the provisions of law prescribing that all the watch officers of vessels of the United States registered for foreign trade shall be citizens of the United States.

Under like conditions, in like manner, and to like extent the President of the United States is also hereby authorized to suspend the provisions of the law requiring survey, inspection, and measurement by officers of the United States of foreign-built vessels admitted to American registry under this act.

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Part III.—SUEZ CANAL MEASUREMENT.

SUEZ CANAL MEASUREMENT RULES.

[Extract from the regulations for the measurement of tonnage, recommended by the International Tonnage Commission, assembled at Constantinople in 1873.]

GENERAL PRINCIPLES.

1. The gross tonnage or total capacity of ships comprises the exact measurement of all spaces (without any exception), below the upper deck, as well as of all permanently covered and closed-in spaces on that deck.

N. B.—By permanently covered and closed-in spaces on the upper deck are to be understood all those which are separated off by decks or coverings, or fixed partitions, and therefore represent an increase of capacity which might be used for the stowage of merchandise, or for the berthing and accommodation of the passengers or of the officers and crew. Thus, any one or more openings, either in the deck or coverings, or in the partitions, or a break in the deck, or the absence of a portion of the partition, will not prevent such spaces being comprised in the gross tonnage, if they can be easily closed in after admeasurement, and thus better fitted for the transport of goods and passengers.

But the spaces under awning decks without other connection with the body of the ship than the props necessary for supporting them, which are not spaces "separated off" and are permanently exposed to the weather and the sea, will not be comprised in the gross tonnage, although they may serve to shelter the ship's crew, the deck passengers, and even merchandise known as "deck loads."

2. "Deck loads" are not comprised in the measurement.

3. Closed spaces for the use or possible use of passengers will not be deducted from the gross tonnage.

4. The determination of deductions for coal spaces may be effected either by the rules of the European Danube Commission of 1871 or by the exact measurement of fixed bunkers.

RULE I.—FOR MEASURING THE GROSS TONNAGE OF EMPTY VESSELS.

ARTICLE 1. The length for the measurement of ships having one or more decks is taken on the tonnage deck, which is—

(*a*) The upper deck for vessels having one or two decks.

(*b*) The second deck from below for vessels having more than two decks.

Measure the length of the ship in a straight line along the upper side of the tonnage deck from the inside of the inner plank (average thickness) at the side of the stem to the inside of the midship stern timber or plank there, as the case may be (average thickness), deducting from this length what is due to the rake of the bow in the thick-

ness of the deck, and what is due to the rake of the stern timber in the thickness of the deck, and also what is due to the rake of the stern timber in one-third of the round of the beam; divide the length so taken into the number of equal parts required by the following table, according to the class in such table to which the ship belongs.

ART. 2. *Class 1.*—Ships of which the tonnage deck is, according to the above measurement, 50 feet long or under, into 4 equal parts.

Class 2.—Ships of which the tonnage deck is, according to the above measurement, above 50 feet long and not exceeding 120 feet, into 6 equal parts.

Class 3.—Ships of which the tonnage deck is, according to the above measurement, above 120 feet long and not exceeding 180 feet, into 8 equal parts.

Class 4.—Ships of which the tonnage deck is, according to the above measurement, above 180 feet long and not exceeding 225 feet, into 10 equal parts.

Class 5.—Ships of which the tonnage deck is, according to the above measurement, above 225 feet long, into 12 equal parts.[1]

ART. 3. Then, the hold being sufficiently cleared to admit of the required depths and breadths being properly taken, find the transverse area of such ship to each point of division of the length as follows: Measure the depth at each point of division, from a point at a distance of one-third of the round of the beam below such deck, or, in case of a break, below a line stretched in continuation thereof, to the upper side of the floor timber at the inside of the limber strake, after deducting the average thickness of the ceiling which is between the bilge planks and the limber strake. Then, if the depth at the midship division of the length do not exceed 16 feet, divide each depth into four equal parts; then measure the inside horizontal breadth at each of the three points of division, and also at the upper and lower points of the depth, extending each measurement to the average thickness of that part of the ceiling which is between the points of measurement. Number these breadths from above—i. e., numbering the upper breadth 1, and so on down to the lowest breadth. Multiply the second and fourth by 4, and the third by 2; add these products together, and to the sum add the first breadth and the fifth. Multiply the quantity thus obtained by one-third of the common interval between the breadths, and the product shall be deemed the transverse area; but if the midship depth exceed 16 feet, divide each depth into six equal parts instead of four, and measure, as before directed, the horizontal breadths at the five points of division and also at the upper and lower points of the depth; number them from above, as before; multiply the second, fourth, and sixth by 4, and the third and fifth by 2; add these products together, and to the sum add the first breadth and the seventh. Multiply the quantity thus obtained by one-third of the common interval between the breadths, and the product shall be deemed the transverse area.

ART. 4. The area of the transverse sections can also be measured with the same precision by the following method of polar coordinates:

Divide each transverse half section into five angular sectors, having the same angle at the apex (this angle is equal to 90/5 of a degree = 18 degrees), and take for the area of each of these sectors

[1] A greater number of divisions is not prohibited so long as they are an even number.

the area of the sector of the circle comprised between its extreme radii, and described by the mean radius.

In making the measurement, measure the mean radius of each sector, of which the two extreme radii would make, the one with the horizontal line and the other with the vertical line, an angle of 9 degrees, while the others are uniformly 18 degrees apart.

In order to obtain their directions, place on the plane of the section a semicircle properly divided, and turned so that its horizontal diameter may pass through the third of the round of the beam, and that its center may be found in the central longitudinal vertical plane of the ship; the radii are to be measured by means of a tape fixed in the center of the semicircle.

In order to calculate the area of the section, square the mean radii thus measured, add them together, and the sum multiplied by 0.31416 shall be deemed to be the area of the section.

ART. 5. Number the transverse sections measured by one of these methods successively 1, 2, 3, etc., giving No. 1 to the extreme limit of the length at the bow, and the last number to the extreme limit of the length at the stern; then, whether the length be divided according to the table into 4 or 12 parts, as in classes 1 and 5, or any intermediate number, as in classes 2, 3, and 4, multiply the second and every even-numbered area by 4, and the third and every odd-numbered area (except the first and last) by 2; add these products together, and to the sum add the first and last, if they yield anything; multiply the quantity thus obtained by one-third of the common interval between the areas, and the product will be the cubical contents of the space under the tonnage deck. The tonnage of this volume is obtained by dividing it by 100, if the measurements are taken in English feet, and by 2.83 if the measurements are taken in meters.[1]

ART. 6. If the ship has a third deck, commonly called a spar deck, the tonnage of the space between it and the tonnage deck shall be ascertained as follows: Measure in feet the inside length of the space at the middle of its height from the plank at the side of the stem to the lining on the timbers at the stern and divide the length into the same number of equal parts into which the length of the tonnage deck is divided, as above directed; measure (also at the middle of its height) the inside breadth of its space at each of the points of division, also the breadth of the stem and the breadth at the stern; number them successively 1, 2, 3, etc., commencing at the stem; multiply the second and all the other even-numbered breadths by 4, and the third and all the other odd-numbered breadths (except the first and last) by 2; to the sum of these products add the first and last breadths; multiply the whole sum by one-third of the common interval between the breadths and the result will give in superficial feet the mean horizontal area of such space; measure the mean height of such space and multiply by it the mean horizontal area, and the product will be the cubical contents of the space; divide this product by 100, or by 2.83 if the measurements are taken in meters, and the quotient shall be deemed to be the tonnage of such space and shall be added to the other tonnage of the ship ascertained as aforesaid; and if the ship has more than three decks the tonnage of each space

[1] In these rules the multiplier 0.353 may be used instead of the divisor 2.83 to reduce cubic meters to tons.

between decks above the tonnage deck shall be severally ascertained in manner above described, and shall be added to the tonnage of the ship ascertained as aforesaid.

ART. 7. If there be a break, poop, or any other permanent closed-in space on the upper deck available for cargo or stores or for the berthing or accommodation of passengers or crew, the tonnage of such space shall be ascertained as follows: Measure the internal mean length of such space in feet and divide it into two equal parts; measure at the middle of its height three inside breadths, namely, one at each end and the other at the middle of the length; then to the sum of the end breadths add four times the middle breadth and multiply the whole sum by one-third of the common interval between the breadths; the product will give the mean horizontal area of such space; then measure the mean height and multiply by it the mean horizontal area; divide the product by 100, or by 2.83 if the measurements are taken in meters, in order to obtain the tonnage of such space.

ART. 8. In measuring the length, breadth, and height of the general volume of the ship or that of the other spaces, reduce to the mean thickness the parts of the ceiling which exceed it. When the ceiling is wanting, or when it is not permanently fixed, the length and breadth are reckoned from the frame of the ship.

RULE II.—FOR MEASURING GROSS TONNAGE OF LADEN SHIPS.

ART. 9. When ships have their cargo on board, or when for any other reason their tonnage can not be ascertained by means of Rule I, proceed in the following manner:

Measure the length on the upper deck from the outside of the outer plank at the stem to the aftside of the sternpost, deducting therefrom the distance between the aftside of the sternpost and the rabbet of the sternpost at the point where the counterplank crosses it.

Measure also the greatest breadth of the ship to the outside of the outer planking or wales.

Then, having first marked on the outside of the ship, on both sides thereof, the height of the upper deck at the ship's sides, girt the ship at the greatest breadth in a direction perpendicular to the keel from the height so marked on the outside of the ship, on the one side, to the height so marked on the other side, by passing a chain under the keel; to half the girth thus taken add half the main breadth; square the sum, multiply the result by the length of the ship taken as aforesaid, then multiply this product by the factor 0.17 in the case of ships built of wood, and by the factor 0.18 in the case of ships built of iron. The product will give approximately the cubical contents of the ship, and the general tonnage can be ascertained by dividing by 100 or by 2.83, according as the measurements are taken in English feet or in meters.

ART. 10. If there be a break, a poop, or other permanent covered and closed-in spaces (as defined in the general principles) on the upper deck, the tonnage of such spaces shall be ascertained by multiplying together the mean length, breadth, and depth of such spaces and dividing the product by 100 or 2.83, according as the measurements are taken in English feet or meters, and the quotients so obtained shall be deemed to be the tonnage of such space, and shall be added to the other tonnage in order to determine the gross tonnage or total capacity of the ship.

DEDUCTIONS [1] TO BE MADE FROM THE GROSS TONNAGE IN ORDER TO ASCERTAIN THE NET TONNAGE.

ART. 11. To find from the gross tonnage of vessels as above set forth the official or net register tonnage, either for sailing vessels or for steamships, the following mode of operation must be resorted to.

SAILING VESSELS.

ART. 12. For sailing vessels deduct the spaces exclusively and entirely occupied by the crew and the ship's officers, those taken up by the cookhouse and latrines exclusively used by the ship's officers and crew, whether they be situated above or below the upper deck; the covered and closed-in spaces, if there be any situated on the upper deck, and used for working the helm, the capstan, the anchor gear, and for keeping the charts, signals, and other instruments of navigation.

Each of the spaces deducted as above may be limited according to the requirements and customs of each country, but the deductions must never exceed in the aggregate 5 per cent of the gross tonnage.

ART. 13. The measurement of these spaces is to be effected according to the rules set forth for the measurement of covered and closed-in spaces on the upper deck; the result, obtained by deducting the total of such allowances from the gross tonnage, represents the net or register tonnage of sailing vessels.

STEAMSHIPS.

ART. 14. For vessels propelled by steam or any other mechanical power, deduct—

1. The same spaces as for sailing vessels (art. 12) with the limitation to 5 per cent of the gross tonnage.

2. The spaces occupied by the engines, boilers, coal bunkers, shaft trunks of screw steamers, and the spaces between decks and in the covered and closed-in erections on the upper deck surrounding the funnels, and required for the introduction of air and light into the engine rooms, and for the proper working of the engines themselves. Such deductions can not exceed 50 per cent of the gross tonnage.

ART. 15. The measurement of the spaces allowed for both in sailing vessels and in steamships (sec. 1 of art. 14) is to be effected according to the rules set forth in articles 12 and 13 for sailing vessels.

Spaces for which allowances are made in steamships only (sec. 2 of art. 14) are measured according to the following rules:

SHIPS HAVING COAL BUNKERS WITH MOVABLE PARTITIONS.

ART. 16. In ships that do not have fixed bunkers, but transverse bunkers with movable partitions, with or without lateral bunkers, measure the space occupied by the engine rooms, and add to it, for

[1] Extract from the final report of the International Tonnage Commission assembled at Constantinople in 1873: "SEC. 17. It is recommended that a penal provision shall be enacted to the effect that if any of the permanent spaces which have been deducted shall be employed either for the use of merchandise or passengers, or in any way profitably employed for earning freight, that space shall be added to the net tonnage, and nevermore be allowed as a deduction."

screw steamers 75 per cent, and for paddle steamers 50 per cent of such space.

By the space occupied by the engine rooms is to be understood that occupied by the engine room itself and by the boiler room together with the spaces strictly required for their working, with the addition of the space taken up by the shaft trunk in screw steamers and the spaces between decks which inclose the funnels and are necessary for the admission of air and light into the engine rooms.

These spaces are measured in the following manner:

Measure the mean depth of the space occupied by the engines and boilers from its crown to the ceiling at the limber strake, measure also three, or, if necessary, more than three breadths of the space at the middle of its depth, taking one of such measurements at each end and another at the middle of the length; take the mean of such breadths; measure also the mean length of the space between the foremost and aftermost bulkheads or limits of its length, excluding such parts, if any, as are not actually occupied by or required for the proper working of the engines and boilers.

Multiply together these three dimensions of length, breadth, and depth, and the product will be the cubical contents of the space below the crown.

Then find the cubical contents of the space or spaces, if any, between the crown aforesaid and the uppermost or poop deck, as the case may be, which are framed in for the machinery or for the admission of light and air, by multiplying together the length, depth, and breadth thereof.

Add such contents as well as those of the space occupied by the shaft trunk to the cubical contents of the space below the crown; divide the sum by 100 or by 2.83, according as the measures are taken in feet or meters, and the result shall be deemed to be the tonnage corresponding to the engine and boiler room which serves as basis for the deductions referred to.

If in any ship in which the space aforesaid is to be measured the engines and boilers are fitted in separate compartments, the contents of each shall be measured separately in like manner, according to the above rules, and the sum of their several results shall be deemed to be the tonnage of the engine rooms which serves, as aforesaid, as basis for the total deductions.

SHIPS WITH FIXED COAL BUNKERS.

ART. 17. In ships with fixed coal bunkers, measure the mean length of the engine and boiler room, including the coal bunkers. Ascertain the area of three transverse sections of the ship (as set forth in the rules given in arts. 3 and 4 for the calculation of the gross tonnage) to the deck which covers the engine.

One of these three sections must pass through the middle of the aforesaid length, and the two others through the two extremities.

Add to the sum of the two extreme sections four times the middle one, and multiply the sum thus obtained by the third of the distance between the sections. This product divided by 100, if the measurements are taken in English feet, or by 2.83 if they are taken in meters, gives the tonnage of the space in question.

If the engines, boilers, and bunkers are in separate compartments, they are separately measured, as above set forth, and the results are added together.

In screw steamers the contents of the shaft trunk are measured by ascertaining the mean length, breadth, and height, and the product of the multiplication of these three dimensions divided by 100 or 2.83, according as the measurements are taken in English feet or in meters, gives the tonnage of such space.

The tonnage of the following spaces between decks, and in the covered and closed-in erections on the upper deck, is ascertained by the same method, viz:

(*a*) The spaces framed in round the funnels.

(*b*) The spaces required for the admission of light and air into the engine rooms.

(*c*) The spaces, if any, necessary for the proper working of the engines.

ART. 18. Instead of the measurement of fixed bunkers, the rules for bunkers with movable partitions, as set forth in article 16, may be applied.

ART. 19. In the case of tugs the allowances are not limited to 50 per cent of the gross tonnage; all the spaces occupied by machinery, boilers, and coal bunkers may be deducted. Nevertheless, if such vessels are not exclusively employed as tugs, the deductions in question can not exceed 50 per cent of the gross tonnage.

ADDITIONAL DEDUCTIONS ALLOWED BY THE SUEZ CANAL CO.

The company allows the following spaces to be included in the deductions specified at article 12 of the regulations for the measurement of tonnage, provided the deductions do not, in the aggregate, exceed 5 per cent of the gross tonnage:

(*a*) The chart room, even when also used as the captain's cabin. When, however, the captain's accommodation comprises several rooms, one of which is the chart room, that room alone is deducted; but in all cases the room used as the chart room must, if it is to be deducted, be situated on the upper deck.

(*b*) The cabins of the ship's doctors, if actually occupied by them.

(*c*) A mess room, if there is one, for the exclusive use of the officers and engineers; or, if they exist, two mess rooms, one of them for the exclusive use of the officers, the other one for the exclusive use of the engineers. A mess room, if there is one, for the exclusive use of the petty officers. No deduction is allowed for the officers' mess room in ships having passenger accommodation, which are not also provided with a passengers' mess room.

(*d*) All spaces fitted as bathrooms or lavatories, for the exclusive use of the ship's officers, engineers, and crew, with the exception of such of the said bathrooms as is available for passengers when no bathroom for their exclusive use is provided.

(*e*) All spaces specially provided for the storage of electric searchlights, the wireless-telegraphy installation, and the operator's berth, on condition that they are situated on the upper deck.

The above specified spaces can only be deducted if they bear a distinctly visible and permanent indication of their exclusive appropriation.

MEASUREMENT OF DECK SPACES (SUPPLEMENTARY RULES OF 1904).

For ships fitted with superstructures the following rules, which concern only such spaces as are excluded from the national tonnage, are applied:

SHIPS WITH ONE TIER OF SUPERSTRUCTURES ONLY.

1. *Poop, bridge, forecastle.*—The following exemptions are allowed:

(*a*) Such length of the poop measured from the inside of the stern timber, at half height of the said poop, as shall be equal to one-tenth of the full length of the ship.

(*b*) The portion of the bridge in way of the air spaces of the engine and boiler spaces, it being understood that such air spaces are not considered to extend beyond the forward bulkhead of the stokehold and the after bulkhead of the main engine room.

(*c*) Such length of the forecastle measured from the inside of the stem at half height of the said forecastle, as shall be equal to one-eighth of the full length of the ship.

(*d*) In each of the above three cases of superstructures, such portions in the walls of the ships as are in way of openings not provided with any means of closing and corresponding to one another.

2. *Poop and bridge combined, or forecastle and bridge combined.*—In each of these combined spaces the following exemptions are allowed:

(*a*) That length only which corresponds to the openings of the engine room and boiler spaces as specified in 1 (*b*), above.

(*b*) Such portions as are in way of openings not provided with any means of closing and corresponding to one another in the walls of the ship.

3. *Shelter decks.*—In the case of shelter decks the following exemptions are allowed:

The portions in way of openings in the side plating of the ship not provided with any means of closing and corresponding to one another.

Such air spaces as are situated within the shelter deck must be measured into the engine-room space and deducted together with 75 per cent of their volume.

SHIPS HAVING MORE THAN ONE TIER OF SUPERSTRUCTURES.

(*a*) The exemptions prescribed in paragraphs 1, 2, and 3, above, are applicable in their entirety to the lower tier only.

(*b*) Tiers above the lower tier are only allowed the exemption of such portions as are in way of openings in the side plating of the ship not provided with any means of closing and corresponding to one another.

REMARK.

Should a ship at any time transit with passengers, merchandise of any kind, or bunker coal, or stores of any description, in any portion whatever of any exempted space, the whole of that space is added to the net tonnage and can nevermore be exempted from measurement.

TAXATION OF DOUBLE BOTTOMS.

The double-bottom spaces will be taxed when they are utilized for carrying oil during the transit of the canal. Contrary, however, to the rules actually in force, this taxation will not be of a permanent character, and the said spaces will not be taxed when they are not utilized.

MEMORANDUM BY THE UNIVERSAL MARITIME CANAL CO. OF SUEZ ON THE APPLICATION OF THE RULES OF 1904 RELATIVE TO THE MEASUREMENT OF SUPERSTRUCTURES.

[Paris, 1909.]

A. DEFINITION OF THE VARIOUS SPACES ABOVE DECK.

In making out the special tonnage certificate of the Suez Canal, the superstructures to be considered are the following:

1. *Isolated spaces.*—Poop, bridge, and forecastle.

2. *Combined spaces.*—Extended poop and extended forecastle. If the poop and forecastle are united by a continuous roof or deck and by walls likewise continuous to the bridge, the spaces thus united constitute, according to definition, a combined space—extended poop in the first case, and extended forecastle in the second case. A complete break either in the roof or walls reverts the case to the category of isolated spaces.

3. *Shelter deck.*—The three spaces united into one constitute a shelter deck.

The superstructures may have a single tier or several tiers. The treatment applicable to the first tier is not the same as that applied to the others, and each tier is to be measured separately.

B. DETERMINATION OF THE DECK SPACES TO WHICH THE RULES OF 1904 APPLY.

Under the rules of 1904 for the determination of Suez tonnage, the spaces hereunder defined are divided into three categories:

First category.—Spaces or portions of spaces closed in according to national measurement rules.

These spaces are always included in Suez tonnage; the rules of 1904 are not applicable to them.

In determining whether or not a space is in this category the Suez Canal Co. accepts the judgment of the national surveyors. Since the rules adopted in the different countries for the determination of national tonnage are considered as practically identical, the treatment of a space is the same for Suez tonnage whatever may be the flag of the ship.

Second category.—Spaces or portions of spaces open according to Suez measurement rules and national measurement rules.

These spaces are not included in the special tonnage certificate of the Suez Canal Co.; the rules of 1904 are not applicable to them.

According to the rules of the commission of Constantinople, the spaces of the second category are: The spaces under awning decks without other connection with the body of the ship than the props necessary for supporting them, which are not spaces "separated off" and are permanently exposed to the weather and the sea, will not be comprised in the gross tonnage, although they may serve to shelter the ship's crew, the deck passengers, and even merchandise known as "deck loads."

The Suez Canal Co. recognizes in the meantime that a space may be considered as open, and consequently excluded from tonnage, if there is an opening not provided with means of closing, the breadth of which is equal to or greater than half the breadth of the deck oppo-

site the opening, and if the space can not be used to shelter other merchandise than deck cargo.

In order to make this last restriction exact, the company recognizes that the space between the open face and a line drawn parallel to this face at a distance equal to half the width of the deck opposite the opening can not be used to shelter merchandise other than deck cargo, and that the remainder of the space may be used to shelter merchandise other than deck cargo and is not to be considered as open.

On the other hand, if in the interior of the superstructure, because of any arrangement whatever and at a distance from the open face less than one-half the width of the deck, the opening becomes less than one-half the width of the deck (above indicated), only that portion of the space comprised between the open face and this point is to be considered as belonging to the second category; the remainder of the space falls within the third category.

Furthermore, in order that a space may be considered as open beyond a distance equal to one-half the width of the deck it is necessary that it be actually isolated from the other superstructures. This condition is not to be considered as fulfilled unless the space is separated from the superstructure immediately adjacent by a break (interval) in the roof and in the walls equal to at least half the width of the deck; if the widths of the deck opposite the openings of two adjoining superstructures are different, the smaller width is to be taken.

Third category.—Spaces or portions of spaces open according to the national measurement rules, but which are closed in according to the Suez rules, because they do not fulfill the conditions defined above for the second category.

It is to these spaces that the rules of 1904 are applicable.

C. NATURE OF THE EXEMPTIONS PERMITTED BY THE RULES OF 1904.

The rules of 1904 define the portions of the spaces comprised in the third category that may be exempted.

In these definitions the length of the ship indicated is the total length comprised between the interior face of the stem and the interior face of the rear sternpost, the measurement being taken at the half height of the superstructures.

It is moreover to be understood, in everything that follows, that in no case shall the exemptions include closed-in spaces or portions of closed-in spaces situated within exemptible parts.

I. Ships with One Tier of Superstructures.

1. ISOLATED SPACES.

The exemptions permitted are as follows:

(*a*) *Poop.*—The portion of this space situated at the stern equal in length to one-tenth of the length of the ship measured from the interior face of the rear sternpost and at half the height of the poop. (Figs. 23–26.)

(*b*) *Bridge.*—The portion of this space situated in way of the air spaces above the engine room and the boilers, it being understood that such air spaces are not considered to extend beyond the forward bulkhead of the stokehold or the after bulkhead of the main engine room. (Figs. 27–30.)

When the air spaces above the engine room and boilers are separated by an interval, the portion of the bridge in way of this interval is exempted. (Figs. 29 and 30.)

The exemption of the portions of the bridge in way of air spaces has the effect of excluding the volume of these air spaces from the tonnage of the ship and therefore from the measurement of the engine room.

(*c*) *Forecastle.*—The portion of this space situated at the prow equal in length to one-eighth the length of the ship as measured from the interior face of the stem at half height of the forecastle. (Figs. 31–34.)

(*d*) In each of these three types of superstructures, the parts situated exactly opposite the openings not provided with means of closing and corresponding to each other in the walls of the ship. (Figs. 26, 30, and 33.)

2. COMBINED SPACES.

(*a*) *Extended poop.*—The extended poop is subject to exemption in the same way as a bridge (portion in way of air funnels), but is not subject to the exemption of one-tenth as is an ordinary poop. (Fig. 36.) The forecastle, separated from the extended poop, is granted the exemption of one-eighth.

It sometimes happens that in ships with isolated spaces the air funnels of the engine, instead of being situated in the bridge, are located in the poop. In this case the poop is treated the same as an extended poop and is in consequence measured; the bridge alone benefits from the exemption permitted in paragraph 1*d* above (parts opposite the openings in the walls of the ship). The forecastle is granted the exemption of one-eighth. (Fig. 36.)

(*b*) *Extended forecastle.*—The extended forecastle is granted the exemption accorded to a bridge (portion situated in way of air funnels), but it is not granted the exemption of one-eighth as in case of an ordinary forecastle. (Fig. 35.) The poop, isolated from the extended forecastle, is granted the exemption of one-tenth.

(*c*) In every combined space the portions situated exactly opposite openings not provided with means of closing and corresponding to each other in the sides of the ship are exempted. (Figs. 35 and 36.)

3. SHELTER DECK.

In the case of shelter decks, the following exemptions are allowed: The portions situated exactly opposite openings in the side plating of the ship not provided with means of closing and corresponding to each other in the opposite walls of the ship are exempted. (Figs. 37 and 38.)

The air spaces situated within a shelter deck should be measured with the remainder of the volume of the engine room and deducted with the 75 per cent increment. (Figs. 37 and 38.)

II. Ships with More Than One Tier of Superstructures.

(*a*) The lower tier alone is granted all the exemptions provided for in paragraphs 1, 2, and 3 above, for ships with a single tier of superstructures. (Figs. 39 and 40.)

In order that the air spaces above the engine and boilers existing in the lower tier of spaces defined in paragraphs 1 and 2 above (isolated spaces and combined spaces) may be comprised in the volume of space occupied by the machinery and then deducted with the 75 per cent increment (fig. 41), the shipowner must forego the exemption of the space situated in way of air spaces (see above (*b*), pp. 68 and 69) and forego the exemption of open parts which may exist in the extremities of the space (see above, second category, pp. 67 and 68), as well as the exemption of parts situated opposite openings corresponding to each other in the walls of the ship. (See above, 1 (*d*) and 2 (*c*).)

(*b*) The upper tiers may only benefit by the exemption of portions situated exactly opposite openings not provided with means of closing and corresponding to each other in the walls of the ship. (Figs. 39 and 40.)

The air spaces above the engine and boiler located in an upper tier may not be included in the volume of the engine and then be deducted with the 75 per cent increment (fig. 41), unless the shipowner foregoes the exemption of open parts which may exist in the extremities of the space (see above, second category, pp. 67 and 68), and unless all the tiers below the tier under consideration are themselves measured the same as between decks.

(*c*) All the rules whereby the company recognizes the category to which a deck space appertains (see above, pp. 68 and 69) are equally applicable to all the tiers.

D. CONDITIONS FOR THE APPLICATION OF EXEMPTIONS PROVIDED FOR BY THE RULES OF 1904

In order that the exemptions permitted may apply, there must be neither merchandise nor supplies of any kind in the portions of spaces which are entitled to benefit by exemption.

If a ship but a single time during her transit carries any merchandise of whatever nature, or coal for bunker purposes, or supplies in whatever amount, in any part of an exempted space, the entire space is added to the net tonnage and may never again be exempted.

E. EXPLANATORY SKETCHES

The sketches following illustrate the treatment applicable to deck spaces in some characteristic cases.

The spaces or portions of spaces of the first category are indicated by slanting lines; they are designated by the letter *F*.

The spaces or portions of spaces of the second category are indicated in white; they are designated by the letter *C*.

The spaces or portions of spaces of the third category are indicated—

1. By horizontal lines when they are exempted; they are then designated by the letters: *A*, for the poop and forecastle; *M* (air funnels of engines) and *m* (in way of air funnels), for the bridge; *O*, for the openings in the walls.

2. By vertical lines whenever they are measured; they are in this case designated by the letter *B*.

1. ISOLATED SPACES.

(*a*) Poop.

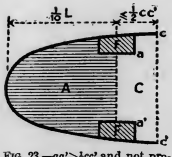

FIG. 23.—$aa' > \frac{1}{2}cc'$ and not provided with means of closing.

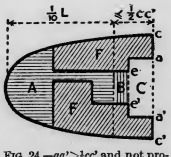

FIG. 24.—$aa' > \frac{1}{2}cc'$ and not provided with means of closing; $ee' < \frac{1}{2}cc'$.

FIG. 25.—$aa' > \frac{1}{2}cc'$ and not provided with means of closing.

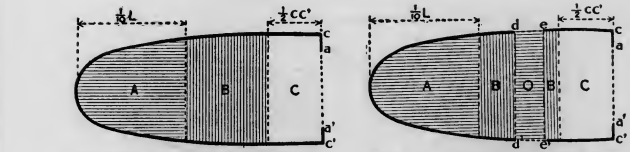

FIG. 26.—$aa' > \frac{1}{2}cc'$ and not provided with means of closing; de and $d'e'$ side openings not provided with means of closing and corresponding to each other in the walls.

N. B.—In figures 23, 24, 25, and 26 it is supposed that the forward face of the poop is separated from the superstructure immediately adjacent by an interval, in the roof and in the walls, at least equal to the one-half breadth of the deck.

(*b*) Bridge.

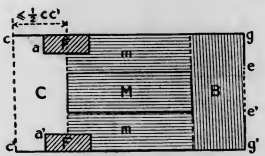

FIG. 27.—$aa' > \frac{1}{2}cc'$ and not provided with means of closing; $ee' < \frac{1}{2}gg'$.

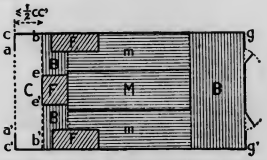

FIG. 28.—$aa' > \frac{1}{2}cc'$ and not provided with means of closing; $be < \frac{1}{2}cc'$; $e'b' < \frac{1}{2}cc'$; gg', partition with doors.

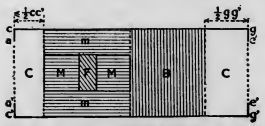

FIG. 29.—$aa' > \frac{1}{2}cc'$, $ee' > \frac{1}{2}gg'$ and not provided with means of closing.

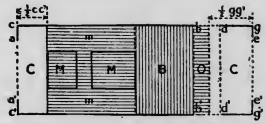

FIG. 30.—$aa' > \frac{1}{2}cc'$, $ee' > \frac{1}{2}gg'$ and not provided with means of closing; bd and $b'd'$ side openings not provided with means of closing and corresponding to each other in the walls.

N. B.—In figures 27, 28, 29, and 30 it is supposed that the after face of the bridge is separated from the superstructure immediately adjacent by an interval, in the roof and in the walls, at least equal to the one-half breadth of the deck. The same supposition is made in figures 29 and 30 for the forward face of the bridge. In short, cc' and gg' should be the whole breadths of the deck.

1. ISOLATED SPACES—Continued.

(c) Forecastle.

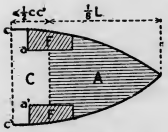

Fig. 31.—$aa' > \frac{1}{2} cc'$ and not provided with means of closing.

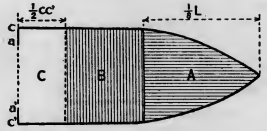

Fig. 32.—$aa' > \frac{1}{2} cc'$ and not provided with means of closing.

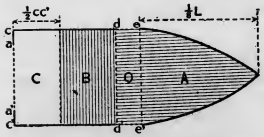

Fig. 33.—$aa' > \frac{1}{2} cc'$ and not provided with means of closing; dc and $d'e'$, side openings not provided with means of closing and corresponding to each other in the walls.

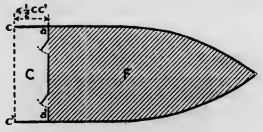

Fig. 34.—aa', partition with doors.

N. B.—In figures 31, 32, 33, and 34 it is supposed that the after face of the forecastle is separated from the superstructure immediately adjacent by an interval, in the roof and in the walls, at least equal to the one-half breadth of the deck.

2. COMBINED SPACES.

(a) or (b) Poop Extended or Forecastle Extended.

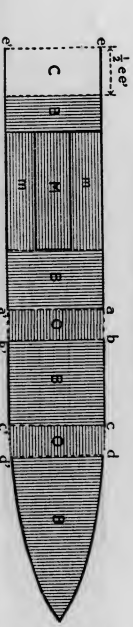

Fig. 35.—eb and $e'b'$, cd and $c'd'$, side openings not provided with means of closing and corresponding to each other in the walls.

N. B.—In figure 35 it is supposed that the after face of the extended forecastle is separated from the superstructure immediately adjacent by an interval, in the roof and in the walls, at least equal to the one-half breadth of the deck.

(a) Poop Sheltering the Air Spaces of the Engine and Boilers.

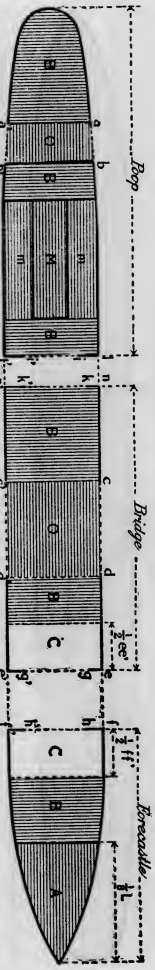

Fig. 36.—eb and $e'b'$, cd and $c'd'$, side openings not provided with means of closing and corresponding to each other in the walls; gg' and hh', transverse openings not provided with means of closing and corresponding to each other in the walls; ff', break in the poop and in the walls greater than one-half of the least breadth of the deck at the extremities of the break; ii' and kk', transverse openings of any breadth whatever and provided or not provided with means of closing; nn', break in the roof and in the walls less than one-half the least breadth of the deck at the right of i or n.

3. SHELTER DECK.

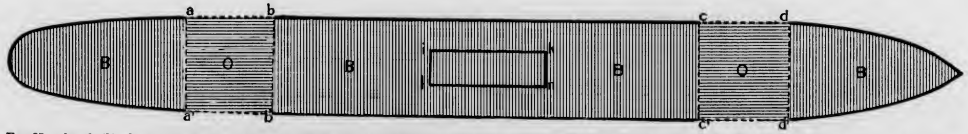

FIG. 37.—*ab* and *a'b'*, *cd* and *c'd'*, side openings not provided with means of closing and corresponding to each other in the walls; *fkln*, air spaces of the engine and boilers to include in the volume of the engine and to deduct with the increment of 75 per cent.

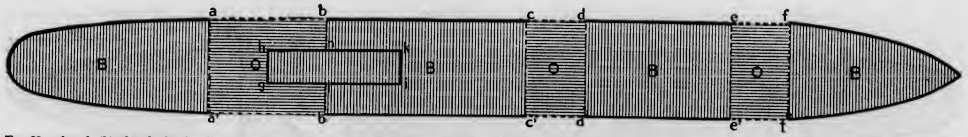

FIG. 38.—*ab* and *a'b'*, *cd* and *c'd'*, *ef* and *e'f'*, side openings not provided with means of closing and corresponding to each other in the walls; *ghklm*, air spaces of the engine and boilers to include in the volume of the engine and to deduct with the increment of 75 per cent.

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SHIPS WITH MORE THAN ONE TIER OF SUPERSTRUCTURES.

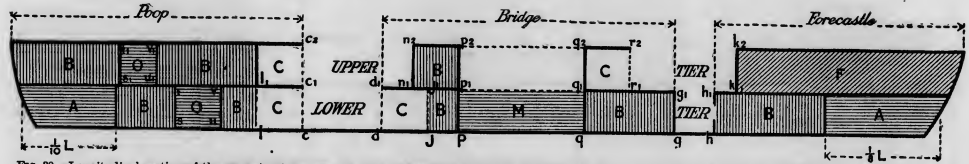

FIG. 39.—Longitudinal section of the superstructures (see the horizontal sections of superstructures in fig. 40). cc_1 and dd_1, c_1c_2 and r_1r_2, transverse openings not provided with means of closing and greater than one-half the corresponding breadth of the deck; cc_1dd_1 and $r_1r_2k_1k_2$, breaks in the roof and in the walls greater than one-half the least breadth of the deck at the extremities of the opening; gg_1 and hh_1, transverse openings of any breadth whatever and provided or not provided with means of closing; gg_1 hh_1, break in the roof and in the walls less than one-half the least breadth of the deck at the right of g or h; $lc=\frac{1}{2}$, the breadth of the deck at c; $dj=\frac{1}{2}$, the breadth of the deck at d; $hc_1=\frac{1}{2}$ the breadth of the deck at c_1; $g_1r_1<\frac{1}{2}$ the breadth of the deck at r_1; n_1n_2 and k_1k_2, partitions with doors; $stuv$ and $s_1t_1u_1v_1$, side openings not provided with means of closing and corresponding to a similar opening in the opposite wall; $p_1p_2q_1q_2$, air spaces of engines and boilers existing in this space are not included in the gross tonnage, but the parts of the space situated by their sides are measured.

SHIPS WITH MORE THAN ONE TIER OF SUPERSTRUCTURES—Continued.

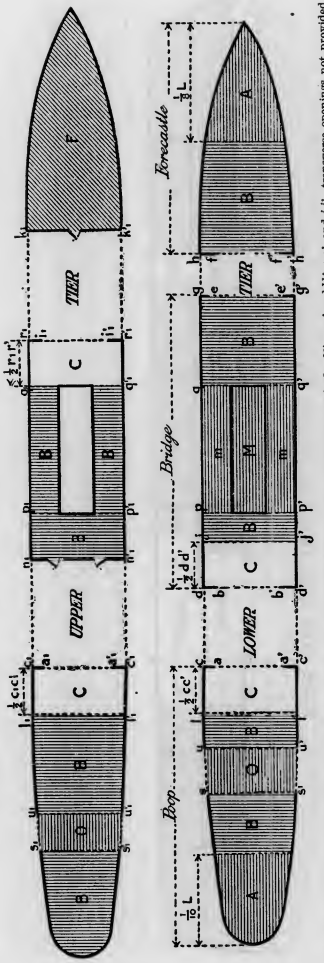

FIG. 40.—Horizontal sections of the superstructures (see the longitudinal section of the superstructures in fig. 39), aa' and bb', ee', and ii', transverses openings not provided with means of closing greater than one-half the corresponding breadths of the deck; $cdc'd'$, $gheg'h'i'$, $klk'l'k'_1l'_1$, breaks in the roof and transverse openings not provided with means of closing; $ghg'h'$, the least of the two corresponding breadths of the deck; ef and $f'i'$, transverse openings of the upper tier not provided with means of closing; $mnm'n'$, $rsr's'$, the least of the two corresponding breadths of the deck; $nn'k$ and kk'_1, partitions with doors; ss_1 and $s's'_1$, st_1 and $s't'_1$, breaks in the roof and transverse openings not provided with means of closing; $pqp'q'_1$, air spaces of the engine and boiler rooms existing in this space are not included in the gross tonnage, but the other parts of the spaces situated by the sides of these air spaces are measured.

SHIPS WITH MORE THAN ONE TIER OF SUPERSTRUCTURES—Continued.

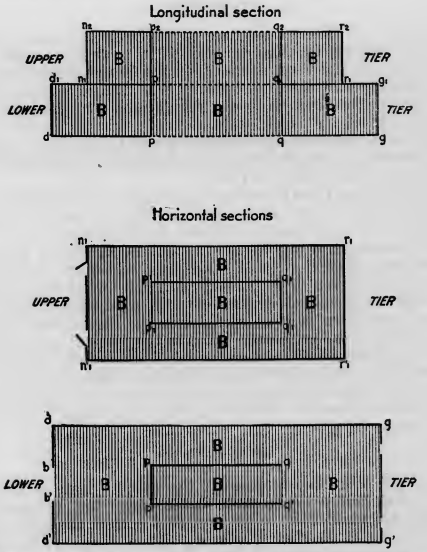

FIG. 41.—Case where, in each tier, at the request of the owners, the superstructure is measured as a between deck, the air spaces are included. dd', gg', $n_1n'_1$, $r_1r'_1$, in plan, and dd_1, gg_1, n_1n_2, r_1r_2, in elevation, are partitions with or without doors; dd' and $n_1n'_1$, in plan, entire breadth of the deck; $pqp'q'$ and $p_1q_1p'_1q'_1$, in plan, and pqp_1q_1 and $p_1q_1p_2q_2$, in elevation, are air spaces of the engine and boilers.

CONDITIONS OF APPLICATION.

Upper tier.—The air spaces existing in the upper tier can not be included in the volume of the engine, to be deducted with the increment of 75 per cent, unless the lower tier is itself measured as a between deck.

Lower tier.—The owner foregoes the exemption of the side parts of the air spaces of the engine and boilers.

N. B.—In the lower figure bb' is less than one-half dd'. If, on the contrary, bb' was greater than one-half dd' (see fig. 40), the owner would have, in order to get the benefit for the two tiers of the deductions of air spaces with the increment of 75 per cent, to forego, besides, the exemption of the open part extending forward from bb' over one-half breadth of the deck.

INSTRUCTIONS TO AMERICAN CUSTOMS OFFICERS

PRELIMINARY

ARTICLE 1. (*a*) The transit dues of the Suez Canal are charged on the basis of the net tonnage ascertained in accordance with the system of measurement recommended by the international commission which assembled at Constantinople in 1873. Extracts from the report of the commission, including the regulations for tonnage measurement, are printed on pages 59–66.

(*b*) Special Suez tonnage certificates will be issued on application by collectors of customs to American shipowners requiring them for ships which will use the Suez Canal.

(*c*) Blank Suez Canal tonnage certificates on application will be supplied by the Bureau of Navigation, Department of Commerce, Washington, D. C., to customs officers requiring them.

(*d*) The certificate signed by the Commissioner of Navigation, when properly filled in, signed, dated, and sealed by the collector of customs, will be given to the master or owner for the use of the ship. (1) A duplicate, complete except as to the signature of the Commissioner of Navigation, will be retained in the files of the collector of customs issuing the certificate. (2) On the issue of a certificate the collector of customs will transmit to the Commissioner of Navigation a memorandum, giving the name of the ship, official number, port of registry, gross and net tonnage according to her American certificate, also the date of issue of the special Suez certificate with the gross and net Suez tonnage.

GROSS TONNAGE

ART. 2. (*a*) For the purpose of the special Suez certificate the measurer will include in the gross measurement the entire cubic contents of the ship under the uppermost deck, except the space (if any) between the inner and outer plating (upon whatever system constructed) known as a double bottom for water ballast,[4] which can be certified as not available for the carriage of cargo, stores, or fuel. The deep water-ballast tanks known as fore or after peak tanks are to be included in tonnage measurement.

(*b*) In the case of vessels which have already been measured for American tonnage it will not be necessary to remeasure the tonnage under the uppermost deck unless the measurer finds that some space has formerly been exempted that must, under the Suez Canal rules, be included, or vice versa.

SPACES ABOVE DECK

ART. 3. For the purpose of the special certificates the measurer must also include in the gross tonnage the entire cubic contents of every covered and closed-in space above the uppermost deck, and with regard to such spaces he should be guided by paragraph 1 of the Suez regulations, page 59, and by the instructions contained in articles 4 and 5 below, which relate only to spaces entitled to exemption from United States tonnage measurement. Spaces covered only

[4] The number and tonnage of each compartment of a double bottom for water ballast should be given in the column of exempted spaces on the second page of the Suez Canal special tonnage certificate.

by planks separated from one another by intervals exceeding 1 inch in breadth are not to be included in the gross tonnage.

OPEN SPACES

ART. 4. (*a*) If the permanent opening measured at the end of the erection (forecastle, bridge space, or poop) is equal to or greater than one-half the breadth of the deck in way of it and is not fitted with a coaming, the portion of the erection measured from the open end, and not exceeding in length such half breadth, is (subject to the following paragraph) to be regarded as an "open space' and described as such on the back of the Suez Canal certificate. When, however, a coaming is fitted to such an opening, the space within it is to be included in the gross tonnage in every case, and only the exemptions provided for in article 5 are to be allowed.

(*b*) If in the interior of an erection, in consequence of any arrangement whatever and at a distance from the open end less than half the breadth of the deck as above defined, the opening is at this point less than the said half breadth, only the length of the space between that point and the open end of the erection is to be regarded as an "open space" and described as such on the back of the Suez Canal certificate.

(*c*) The above instructions respecting "open spaces" apply to deck erections extending from side to side, whether situated in the lowest or any other tier, but in all cases where the openings in these erections are less than the half breadth of the deck in way of them they are to be measured in the gross tonnage, and only the exemptions provided for in article 5 are to be allowed. When, however, two side-to-side erections are separated by an interval the length of which is less than the least half breadth of the deck in way of such interval, then, whatever be the breadth of the permanent openings, the erection less the interval are to be measured in the gross tonnage, and only the exemptions provided for in article 5 are to be allowed.

EXEMPTED SPACES

ART. 5. In the case of shelter-deck spaces with one or more openings in the shelter deck and sides of the vessel the whole of the space under the shelter deck should be included in the tonnage measurement with the exception of that part of the space which is immediately abreast the openings (if any) in the sides of the ship.

(*a*) In all cases where a vessel is fitted with forecastle, bridge space, and poop there shall be exempted from measurement (1) such length of the forecastle measured from the inside of the stem at half height of the said forecastle as shall be equal to one-eighth of the full length of the ship; (2) such length of the poop measured from the inside of the stern timber at half height of the said poop as shall be equal to one-tenth of the full length of the ship; (3) such length of the bridge as is equal to the length of the actual deck openings to engine and boiler spaces, it being understood that such openings shall not be considered to extend beyond the forward bulkhead of the stokehold and the after bulkhead of the main engine room.

(*b*) In all cases where the poop and bridge or forecastle and bridge are combined and continuous, then only that length in each

case which is due to the openings of engine and boiler spaces as defined under paragraph (*a*), (3), above shall be exempted from measurement.

(*c*) From the side-to-side erections referred to in the foregoing paragraphs (*a*) and (*b*) further exemptions may also be allowed for the portions of the spaces abreast of the permanent openings, if any, in the side plating and also for the "open spaces" referred to in article 4 above.

(*d*) When the engines are aft and the light and air casings are situated in an ordinary poop, the space is to be dealt with as for a combined poop and bridge, but the bridge space is to benefit only by the exemption of the portion abreast the permanent openings, if any, in the side plating or "open spaces" at the ends.

(*e*) By "full length of the ship" shall be understood in all cases such length as is comprised between the inside of stem at half height of the forecastle to the inside of the stern timber at half height of the poop.

(*f*) The exemptions provided for in paragraphs (*a*) and (*b*) above apply, in their entirety, only to deck erections situated in the lowest tier; the only exemptions to be made in side-to-side erections situated above this tier, and besides the "open spaces," if any, are those portions immediately abreast of any permanent openings which may exist in the side plating.

(*g*) In the case of shelter-deck spaces, the exemptions provided for may be allowed on the written request of the owners, either in the shelter-deck space, as provided for in the first paragraph, or in the erections on the shelter deck, as provided for in paragraphs (*a*) and (*b*), but in no case are exemptions to be allowed under the first paragraph in addition to exemptions under paragraphs (*a*) and (*b*).

LIGHT AND AIR CASINGS OVER ENGINES AND BOILERS

ART. 6. The engine and boiler casings in the shelter-deck spaces are to be included in the gross tonnage and in the engine-room measurement, even if situated in part within an otherwise exempted space abreast permanent side openings.

In the case of side-to-side erections above the lowest tier the light and air casings may be included in the gross tonnage and actual engine room, provided the owner makes a written application for same, and also on condition that the side-to-side spaces beneath it have been similarly treated. When, however, the spaces are so dealt with no exemption is to be made from such spaces for any other portion whatever, either in the tier in question or in those beneath it.

Subject to the foregoing, the light and air casings in all erections above the first tier are to be exempted from measurement.

MARKING OF EXEMPTED SPACES

ART. 7. All exempted spaces must be permanently and conspicuously marked by a plate securely fixed to each side of the vessel to indicate the limits and length allowed, corresponding with the particulars shown upon the back of the Suez Canal certificate; the center of such plates should be marked thus, and the inscription upon them should be as follows:

This space _____ feet in length from the inside of the { stem / or / stern timber } at the half height of the space to this mark is exempted from Suez Canal tonnage upon the ground that no cargo or stores are carried therein.

ACCESS

ART. 8. The measurers must see that some satisfactory means are provided either by manhole or hatchway for gaining access to the exempted parts in the event of the parts adjacent being filled with cargo. It would be well in all cases for the manhole or other opening to terminate at the point to which the exempted space extends.

PENALTY FOR CARGO IN EXEMPTED SPACES

ART. 9. The regulations of the Suez Canal Co. provide that if at any time a vessel shall perform transit with cargo or stores carried in any portion of any exempted space, then the whole of that space shall be added to the net tonnage and can only be again exempted from measurement after a bona fide change in the ownership of the vessel.

NET TONNAGE

ALLOWANCE FOR PROPELLING POWER[5]

ART. 10. Having ascertained the gross tonnage in the manner described above, the measurer will then proceed to measure the engine room, boiler space, and shaft trunk as for a certificate of American registry and note in the proper place in the measurement form and on the certificate the cubic contents of each.

In cases where the owners elect not to use the "Danube rule"[6] but to have the actual bunker space as well as the actual engine space measured and deducted, the measurer will measure separately the bunkers and record the cubic capacity of each in the proper place in the measurement form. In doing this he is not to include any bunkers that are not absolutely permanent, or from which the coals can not be directly trimmed into the engine room or stokehold, or into which any access can be obtained otherwise than through the ordinary coal chutes on deck and from the doors opening into the engine room or stokehold. He is to be specially careful that thwartship bunkers which can be in any way extended are not included in the measurements for deductions. In no case, except in the case of tugs, is the engine-room allowance to exceed 50 per cent of the gross tonnage of the ship.

CREW-SPACE DEDUCTIONS

ART. 11. In measuring the deductions for crew space the measurer will be careful to ascertain the cubic contents of each space as at present, but he must bear in mind that no deduction is to be made for the accommodation of the captain, purser, clerk, etc., or for the berths of stewards, cooks, in passenger steamers, or passengers' serv-

[5] Include bona fide settling tanks below deck in the propelling machinery space as in the admeasurement of vessels for registry.

[6] If the ship has not permanent bunkers, or if she has only lateral bunkers, and her coal is stowed in bunkers shut off from the hold by movable partitions, then the spaces of these lateral and temporary bunkers are not to be measured. In this case the rule to be applied is that in force on the Danube, namely, an allowance is made for the coal space by giving 50 per cent of the space occupied by the engine in a paddle-wheel steamer and 75 per cent in a screw steamer.

ants. Passages exclusively for access to deducted crew spaces may themselves be included in the deductions.[7]

The following special deductions in respect of accommodation spaces are allowed:

(*a*) Doctors' cabins, if actually occupied by the doctors.

(*b*) All spaces fitted as bathrooms or lavatories for the exclusive use of the ship's officers, engineers, and crew, with the exception of such of the said bathrooms as are available for passengers when no bathroom for their exclusive use is provided.

(*c*) A mess room,[8] if there is any, for the exclusive use of the officers; a second mess room, if there is any, for the exclusive use of the engineers; a third mess room, if there is any, for the exclusive use of the petty officers; also mess rooms, if any, for the exclusive use of seamen and firemen.

No deduction is allowed for the officers' mess room in ships having passenger accommodation which are not also provided with a passengers' mess room.

(*d*) All spaces fitted as hospitals for the exclusive use of the ship's officers, engineers, and crew, with the exception of such spaces as are available for passengers when no hospital for their exclusive use is provided.

No deduction is to be allowed for crew space or for officers' cabins unless the regulations as to lighting, seaworthiness, ventilation, etc., are complied with, nor unless the words "Certified to accommodate —— seamen," "Certified to accommodate —— officer or —— officers," as the case may be, are cut in or painted on or over the doorway of each deducted space.

All water-closets having been included in the first place in the gross tonnage, those that are to be included in the deduction from tonnage are to have the words "Certified for the use of —— crew" cut in or painted on or over the door.

In the case of passenger steamers on which there is only one galley neither the galley nor the space occupied by the cook should be included in the deductions from the gross tonnage.

When there are two or more galleys, however, the space occupied by the galley or galleys exclusively used for the crew should be included in the deductions, and the words "Certified for the use of the crew" should be cut in or painted on or over each doorway of the space.

NAVIGATION-SPACE DEDUCTIONS

ART. 12. Articles 12 and 14 of the Suez Canal Co.'s regulations allow the deduction of any covered and closed-in spaces on the upper deck used for working the helm, the capstan, the anchor gear, and for keeping the charts, signals, and other instruments of navigation. Under this rule the wheelhouse, chart room, winch house, lookout house, signal house, steam-steering house, and the spaces provided for the storage of electric searchlights and wireless-telegraphy appliances on the upper deck are to be deducted from the gross tonnage, in which, however, they are in every case first to be included.

The chart room may be deducted, even if it is also used as the captain's cabin. When, however, the captain's accommodation comprises several rooms, one of which is the chart room, that room alone is deducted; but in all cases the room used as a chart room must, if it is to be deducted, be situated on the upper deck.

When the donkey boiler in a closed-in space on the upper deck is not exclusively used for the working of the helm, the capstan, and anchor gear, or any of them, but is also available for hoisting the cargo, the space is not to be included in the deductions from the gross tonnage. This instruction does not apply to the donkey-boiler house on the upper deck of men-of-war and troopships.

[7] Passages serving other spaces, deductible or not, are not entitled to deduction.

[8] Pantries are not to be included in this deduction nor deducted under any other head.

MARKING OF DEDUCTED SPACES

ART. 13. In granting deduction for the chart house, winch house, and wheelhouse, or any other covered and closed-in space on the uppermost deck used for navigating the ship, the measurer must see that the words "Certified for use in navigating the ship" are cut in or painted on or over the doorway of the space, and in like manner all spaces deducted from the gross tonnage are to have cut over them or painted on them a notice stating the purpose for which they are certified.

GENERAL

ART. 14. In no case is any space to be deducted from the tonnage that is not first included in the gross tonnage, and in no case is the sum total of the deductions (other than the allowance for propelling power) to exceed 5 per cent of the gross tonnage of the ship.

No deduction is to be made for passenger accommodation, captain's or passengers' water-closets or lavatories, etc., passengers' cooking houses, or baggage storerooms, or for any other purpose than those indicated above.

It may happen that there are in certain ships some awnings or other constructions used merely for shelter (see second part of note to par. 1, Suez Canal Co.'s regulations), the space under which is not to be included in the gross tonnage, and is therefore not to be deducted afterwards. When this is so, the measurer should make a careful note of the particulars in the proper place in the forms.

The aggregate of galleys, water-closets, lavatories, etc., above deck and independent of other superstructures should be recorded with the items of gross tonnage under their appropriate head; but those that are in superstructures devoted partly to other uses may be included in and reported with the tonnage of such superstructures. Those below deck will be included in the below deck space. Of course, such of these spaces as are entitled to deduction will be deducted under their appropriate heads.

The same remarks apply to the spaces for working the ship, such as wheelhouse, chart house, anchor gear, radio house, steering gear, etc. (art. 12, p. 82), except that none of these situated below deck may be deducted.

Subject to articles 4 and 5, pages 79 and 80, open passages in superstructures should be included in the tonnage of the superstructure in which they are situated, except such transverse passages which extend the full width of a side-to-side superstructure and whose openings in the side walls of the superstructure correspond to each other and are not provided with any means of closing.

Such spaces as steering gear, anchor gear, etc. (above deck), not required to be marked under the rules for registry are to be marked

"Certified for use in navigating the ship" before they can be deducted in finding the net tonnage to appear on the certificate. (Art. 13, p. 83.)

Show on the left-hand side of the second page of the certificate the dimensions and tonnage of a deck erection which is partly exempted from and partly included in tonnage, carrying to the column of tons the amount included in tonnage and showing on the opposite side of the page the dimensions and tonnage of the portions exempted. In the case of a deck erection entirely exempted give the particulars on the right-hand side only.

When the collector is in any doubt whether any space should be exempted or deducted he should apply for instructions to the Commissioner of Navigation.

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Part IV.—MEASUREMENT OF UNITED STATES NAVAL VESSELS FOR THE SUEZ CANAL

INSTRUCTIONS AND REGULATIONS

[Compiled and prepared by the scientific and computing branch of the Bureau of Construction and Repair, Department of the Navy, 1909. Revised by Bureau of Construction and Repair, 1924]

GENERAL INSTRUCTIONS

1. UNIFORMITY IN MEASUREMENTS.—These instructions are compiled for use in the preparation of tonnage certificates, upon which tonnage tolls may be collected, when ships of the United States Navy have occasion to pass through the Suez Maritime Canal, and it is of great importance not only that the following laws and regulations be followed but that all the required measurements be taken and calculations made in one uniform and correct manner, so that one general system may prevail throughout.

2. PREPARATION OF CERTIFICATES.—Suez Canal certificates of tonnage shall be prepared in full detail from careful calculations made in accordance with the following statutes, regulations, and instructions, and special care shall be exercised in their preparation in order that no incomplete or obscure entries shall appear in a certificate which might constitute ground for investigation or possible remeasurement on the part of the canal authorities.

3. REMEASUREMENT UNDER RULE FOR UNLADEN SHIPS.—Any ship which may have, of necessity, been measured while laden shall, at the earliest practicable time thereafter, be measured in the usual manner, and the results thus obtained shall supersede such previous calculation.

4. SHIPS PREVIOUSLY UNDER FOREIGN FLAGS.—Whenever it becomes necessary to provide a Suez Canal certificate for any vessel which may have been previously registered under a foreign flag, and have had a foreign certificate issued to her prior to becoming the property of the United States, a new calculation shall be made in accordance with these instructions, and a new certificate shall be issued, which shall constitute the correct Suez tonnage for that vessel.

5. ALTERATION OF CERTIFICATES DUE TO CHANGES.—If after a certificate has been issued to any naval ship it becomes necessary to change or alter her by the addition or removal of any space which will affect the tonnage, such spaces shall be measured and a new certificate issued, which shall represent the correct tonnage of the ship after the addition or deduction shall have been made.

6. USE OF FIGURES FROM A PREVIOUS CALCULATION.—When, in preparing the Suez certificate, any vessel's national certificate of registry is available, it will not be always necessary to remeasure the tonnage under the uppermost deck, unless it is found that some space has been exempted in such certificate of registry that must, under these rules, be included, or vice versa, provided the certificate has been

issued by a country which had previously adopted a system of tonnage measurement similar in its essential features to the system herein below.

7. DESIRABILITY OF RETAINING ORIGINAL FIGURES. — Whenever changes in a ship's arrangement necessitate alterations in a certificate, it is to be understood that it is desirable that the original figures for below and between deck spaces be retained, if possible; therefore no new figures will be made for such spaces unless directly affected by the changes in the ship, as the small differences, due to a new calculation, are of minor consequence and are to be avoided.

8. MEASUREMENTS FROM PLANS.—Measurements taken from finished plans of any naval vessel, corrected to cover the latest arrangements affecting tonnage spaces, shall be considered to be as accurate and useful in the calculation of tonnage as dimensions lifted directly from the ship, inasmuch as these plans are taken from work under the direction of a representative of the Bureau of Construction and Repair.

9. SISTER SHIPS.—In determining the tonnage of sister ships actually built from the same lines and molds and having nearly similar arrangements, it will be necessary to calculate the similar portions in the case of one ship only; the results shall then be considered to apply equally well to any of such ships.

10. SPACES REASONABLE IN EXTENT.—In vessels of the Navy all spaces as constructed or as altered shall be considered as being reasonable in extent, since it is clearly disadvantageous to the Navy to evade any tonnage dues at the expense of maximum efficiency of general arrangement of a ship's compartments.

11. CERTIFICATION OF SPACES.—All spaces on vessels of the Navy shall be considered as having been properly certified, since it is usual on naval ships to clearly designate the use of a compartment by a name plate over the doorway or opening thereto.

12. FULFILLMENT OF REQUIREMENTS.—The requirements for lighting, ventilation, and seaworthiness shall be considered as having been fulfilled in all spaces on United States naval vessels, whether assigned to officers, crew, machinery, for the passage of light and air, or for any other purpose.

13. ACCURACY OF MEASUREMENTS.—All general measurements will be sufficiently accurate if carried to the nearest hundredth of a foot.

14. DEVIATION FROM METHOD.—Although the rules and regulations as hereinafter laid down will, in gereral, fully cover the measurement of ships of various forms and diversified construction, it must be borne in mind that in order to obtain a correct result when the prescribed method is inadequate, in detail, the geometrical formula best adapted to the results to be obtained shall be utilized.

15. EXEMPTED SPACES.—Should there be any spaces exempted in figuring the tonnage of a ship, such spaces should be enumerated on the certificate, and when no spaces are exempt that fact should be noted.

16. TO REDUCE TONS TO CUBIC METERS.—In order to change tons of 100 cubic feet each to cubic meters multiply by the factor 2.83.

GROSS TONNAGE

In obtaining the gross tonnage of any United States naval ship the rules for measurement of ships of American register shall prevail

(see Revised Statutes of the United States Nos. 4150, 4153, etc.), with such modifications as may be made necessary by the "Regulations for the Navigation of the Suez Maritime Canal."

1. DEFINITION OF GROSS TONNAGE.—The gross tonnage or total capacity of ships comprises the exact measurement of all spaces (without any exception) below the upper deck, as well as of all permanently covered or closed-in spaces on that deck.

2. DEFINITION OF COVERED OR CLOSED-IN SPACES.—By permanently covered and closed-in spaces on the upper deck are to be understood all those which are separated off by decks or coverings, or fixed partitions, and therefore represent an increase of capacity which might be used for the stowage of merchandise or for the berthing and accommodation of the passengers, or of the officers and crew. Thus, any one or more openings either in the deck or coverings, or in the partitions, or a break in the deck, or the absence of a portion of the partition, will not prevent such spaces being comprised in the gross tonnage if they can be easily closed in after admeasurement and thus better fitted for the transport of goods and passengers. But the spaces under awning decks without other connection with the body of the ship than the props necessary for supporting them, which are not spaces "separated off" and are permanently exposed to the weather and the sea, will not be comprised in the gross tonnage, although they may serve to shelter the ship's crew, the deck passengers, and even merchandise known as "deck loads" are not comprised in the measurement.

3. SHELTER DECKS.—In the case of shelter-deck spaces the whole of the space under the shelter deck is included in the tonnage measurement with the exception of that part of the space which is immediately abreast the openings (if there are any) in the sides of the ship.

4. DEFINITION OF TONNAGE DECK.—The tonnage deck in vessels having three or more decks to the hull shall be the second deck from below; in all other cases the upper deck of the hull is to be the tonnage deck.

5. MEASUREMENTS.—All measurements to be taken in feet and fractions of feet; and all fractions of feet shall be expressed in decimals.

6. METHOD OF MEASURING UNLADEN SHIPS (RULE I).—The register tonnage of every vessel built within the United States, or owned by a citizen or citizens thereof, shall be her entire internal cubical capacity in tons of 100 cubic feet each, to be ascertained as follows:

Below tonnage deck.—Measure the length of the vessel in a straight line along the upper side of the tonnage deck, from the inside of the inner plank, average thickness, at the side of the stem to the inside of the plank on the stern timbers, average thickness, deducting from this length what is due to the rake of the bow in the thickness of the deck and what is due to the rake of the stern timber in the thickness of the deck, and also what is due to the rake of the stern timber in one-third of the round of the beam; divide the length so taken into the number of equal parts required by the following table, according to the class in such table to which the vessel belongs.

The classes shall be arranged as follows:

Class 1. Vessels of which the tonnage length, according to the above measurements, is 50 feet or under—into 6 equal parts.

Class 2. Vessels of which the tonnage length, according to the above measurements, is above 50 feet and not exceeding 100 feet—into 8 equal parts.

Class 3. Vessels of which the tonnage length, according to the above measurements, is above 100 feet and not exceeding 150 feet—into 10 equal parts.

Class 4. Vessels of which the tonnage length, according to the above measurements, is 150 feet and not exceeding 200 feet—into 12 equal parts.

Class 5. Vessels of which the tonnage length, according to the above measurements, is above 200 feet and not exceeding 250 feet—into 14 equal parts.

Class 6. Vessels of which the tonnage length, according to the above measurements, is above 250 feet—into 16 equal parts.

Then the hold being sufficiently cleared to admit of the required depths and breadths being properly taken, find the transverse area of such vessel at each point of division of the length, as follows:

Measure the depth at each point of division from a point at a distance of one-third of the round of the beam below such deck; or, in case of a break, below a line stretched in continuation thereof to the upper side of the floor timber at the inside of the limber strake, after deducting the average thickness of the ceiling, which is between the bilge planks and limber strake; then, if the depth at the midship division of the length does not exceed 16 feet divide each depth into four equal parts; then measure the inside horizontal breadth at each of the three points of division and also at the upper and lower points of the depth, extending each measurement to the average thickness of that part of the ceiling which is between the points of measurement; number these breadths from above, numbering the upper breadth 1, and so on down to the lowest breadth; multiply the second and fourth by 4 and the third by 2; add these products together, and to the sum add the first breadth and the last, or fifth; multiply the quantity thus obtained by one-third of the common interval between the breadths, and the product shall be deemed the transverse area; but if the midship depth exceed 16 feet divide each depth into six equal parts instead of four and measure, as before directed, the horizontal breadths at the five points of division and also at the upper and lower points of the depth; number them from above as before; multiply the second, fourth, and sixth by 4 and the third and fifth by 2; add these products together, and to the sum add the first breadth and the last, or seventh; multiply the quantities thus obtained by one-third of the common interval between the breadths, and the product shall be deemed the transverse area.

Having thus ascertained the transverse area at each point of division of the length of the vessel, as required above, proceed to ascertain the register tonnage of the vessel in the following manner:

Number the areas successively 1, 2, 3, etc., number 1 being at the extreme limit of the length at the bow and the last number at the extreme limit of the length at the stern; then, whether the length be divided according to the table into 6 or 16 parts, as in classes 1 and 6 or any intermediate number, as in classes 2, 3, 4, and 5, multiply the second and every even-numbered area by 4, and the third, and every odd-numbered area, except the first and the last, by 2; add these products together, and to the sum add the first and last if they yield anything; multiply the quantities thus obtained by one-third of the common interval between the areas, and the product will be the cubical contents of the space under the tonnage deck; divide this product by 100, and the quotient, being the tonnage under the tonnage deck, shall be deemed the register tonnage of the vessel, subject to the additions hereinafter mentioned.

Inner bottom.—In the case of a ship constructed with a double bottom for water ballast, if the space between the inner and outer plating thereof is certified by the collector to be not available for the carriage of cargo, stores, or fuel, then the depth of the vessel shall be taken to be the upper side of the inner plating of the double bottom, and that upper side shall, for the purposes of measurement, be deemed to represent the floor timber.

Between decks.—If a vessel has a third deck, or spar deck, the tonnage of the space between it and the tonnage deck shall be ascertained as follows:

Measure in feet the inside length of the space, at the middle of its height, from the plank at the side of the stem to the plank on the timbers at the stern, and divide the length into the same number of equal parts into which the length of the tonnage deck is divided; measure also at the middle of its height the inside breadth of the space at each of the points of division, also the breadth of the stem and the breadth at the stern; number them successively 1, 2, 3, etc., commencing at the stem; multiply the second, and all other even-numbered breadths by 4 and the third and all the other odd-numbered breadths, except the first and last, by 2; to the sum of these products add the first and last breadths, multiply the whole sum by one-third of the common interval between the breadths and the result will give, in superficial feet, the mean horizontal area of such space; measure the mean height between the plank of the two decks and multiply by it the mean horizontal area, and the product will be the cubical contents of the space; divide this product by 100 and the quotient shall be deemed to be the tonnage of such space and shall be added to the other tonnage of the vessel ascertained as above directed; and if the vessel has more than three decks, the tonnage of each space between decks, above the tonnage decks, shall be severally ascertained in the manner above described and shall be added to the tonnage of the vessel, ascertained as above directed.

Deck houses, breaks, etc.—If there be a break, a poop, or any other permanent closed-in space on the upper deck available for cargo or stores, or for the berthing or accommodation of passengers or crew, the tonnage of that space shall be ascertained and added to the gross tonnage.

Measure the internal mean length of such space in feet and divide it into an even number of equal parts, of which the distance asunder shall be most nearly equal to those into which the length of the tonnage deck has been divided; measure at the middle of its height the inside breadths, namely, one at each end and at each of the points of division, numbering them successively one, two, three, etc.; then to the sum of the end breadths add four times the sum of the even-numbered breadths and twice the sum of the odd-numbered breadths, except the first and last, and multiply the whole sum by one-third of the common interval between the breadths;

the product will give the mean horizontal area of such space; then measure the mean height between the planks of the decks and multiply by it the mean horizontal area; divide the product by 100, and the quotient shall be deemed to be the tonnage of such space, and shall be added to the tonnage under the tonnage decks, ascertained as aforesaid: *Provided*, That nothing shall be added to the gross tonnage for any sheltered space above the upper deck which is under cover and open to the weather; that is, not inclosed.

7. OPEN VESSELS.—Open vessels are not comprised within the proposed international rules of measurement.—Report of the International Tonnage Commission, assembled at Constantinople in 1873, section 16.

8. METHOD OF MEASURING LADEN SHIPS (RULE II).—In order to enable those who may be charged with the calculation of tonnage of ships of the United States Navy to properly interpret such figures as may appear in any certificate prepared by the Suez authorities themselves, it may be well to quote the method followed in the measurement of laden ships which have no certificate to accompany an application for passage through the canal.

The deductions from the gross are the same as those appearing under the heading "Net tonnage," but the total capacity or gross figure is arrived at as follows:

RULE II.—FOR LADEN SHIPS

ART. 9. When ships have their cargo on board, or when for any other reason their tonnage can not be ascertained by means of Rule 1, proceed in the following manner:

Measure the length on the upper deck from the outside of the outer plank at the stem to the aft side of the sternpost, deducting therefrom the distance between the aft side of the sternpost and the rabbet of the sternpost at the point where the counterplank crosses it. Measure also the greatest breadth of the ship to the outside of the outer planking or wales.

Then, having first marked on the outside of the ship, on both sides thereof, the height of the upper deck at the ship's sides, girt the ship at the greatest breadth in a direction perpendicular to the keel from the height so marked on the outside of the ship on the one side to the height so marked on the other side by passing a chain under the keel; to half the girth thus taken add half the main breadth; square the sum, multiply the result by the length of the ship taken as aforesaid; then multiply this product by the factor 0.17 in the case of ships built of wood and by the factor 0.18 in the case of ships built of iron. The product will give approximately the cubical contents of the ship, and the general tonnage can be ascertained by dividing by 100 or by 2.83, according as the measurements are taken in English feet or in meters.

ART. 10. If there be a break, a poop, or other permanent covered and closed-in spaces (as defined in the general principles) on the upper deck, the tonnage of such spaces shall be ascertained by multiplying together the mean length, breadth, and depth of such spaces and dividing the products by 100, or 2.83, according as the measurements are taken in English feet or meters, and the quotients so obtained shall be deemed to be the tonnage of such spaces and shall be added to the other tonnage in order to determine the gross tonnage or total capacity of the ship.

9. HATCHES.—The cubical contents of the hatchways shall be obtained by multiplying the length and breadth together and the product by the mean depth taken from the top of beam to the underside of the hatch. From the aggregate tonnage of the hatchways there shall be deducted one-half of 1 per cent of the gross tonnage, and the remainder only shall be added to the gross tonnage of the ship, exclusive of the tonnage of the hatchways.

10. LIGHT AND AIR SPACES TO MACHINERY.—On a request in writing to the Commissioner of Navigation by the owners of a ship the tonnage of such portion of the space or spaces above the crown of the engine room and above the upper deck as is framed in for the machinery or for the admission of light and air and not required to be added to the gross tonnage shall, for the purpose of ascertaining the tonnage of the space occupied by the propelling power, be added to the tonnage of the engine space; but it shall then be included in the gross tonnage. Such space or spaces must be reasonable in extent, safe, and seaworthy and can not be used for any purpose other than the machinery or for the admission of light and air to the machinery, or for the admission of light and air to the machinery or boilers of the ship.

11. EXEMPTIONS.—For ships fitted with superstructures the following rules, which concern only such spaces as are excluded from the national tonnage, are applied:

1. SHIPS WITH ONLY ONE TIER OF SUPERSTRUCTURES

1. *Poop, bridge, forecastle.*—The following exemptions are allowed:

(*a*) Such length of the poop measured from the inside of the stern timber, at half height of the said poop, as shall be equal to one-tenth of the full length of the ship.

(*b*) The portion of the bridge in way of the air spaces of the engine and boiler spaces, it being understood that such air spaces are not considered to extend beyond the forward bulkhead of the stokehold and the after bulkhead of the main engine room.

(*c*) Such length of the forecastle, measured from the inside of the stem at half height of the said forecastle, as shall be equal to one-eighth of the full length of the ship.

(*d*) In each of the above three cases of superstructure such portions in the walls of the ships as are in way of openings not provided with any means of closing and corresponding to one another.

2. *Poop and bridge combined, or forecastle and bridge combined.*—In each of these combined spaces the following exemptions are allowed:

(*a*) That length only which corresponds to the openings of the engine room and boiler spaces as specified in (*b*) above.

(*b*) Such portions as are in way of openings not provided with any means of closing and corresponding to one another.

3. *Shelter decks.*—In the case of shelter decks the following exemptions are allowed:

The portions in way of openings in the side plating of the ship not provided with any means of closing and corresponding to one another.

Such air spaces as are situated within the shelter deck must be measured into the engine-room space and deducted together with 75 per cent of their volume.

2. SHIPS HAVING MORE THAN ONE TIER OF SUPERSTRUCTURES

(*a*) The exemptions prescribed in paragraphs 1, 2, and 3 above are applicable in their entirety to the lower tier only.

(*b*) Tiers above the lower tier are only allowed the exemption of such portions as are in way of openings in the side plating of the ship not provided with any means of closing and corresponding to one another.

12. USE OF EXEMPTED SPACES.—Should a ship at any time transit with merchandise of any kind, or bunker coal, or stores of any description, in any portion whatever of any exempted space, the whole of that space is added to the net tonnage and can nevermore be exempted from measurement.

INSTRUCTIONS AND DEFINITIONS AS TO GROSS TONNAGE

1. DECKS NOT CONSIDERED CONTINUOUS.—In deciding which deck fulfills the requirements for a tonnage deck, neither the platform decks when composed of several flats nor the armored protective deck when such protective deck merges into and forms only a portion of another deck shall be considered a complete deck within the interpretation of the meaning of the law.

2. BREAK DECKS, IN TWO-DECKED SHIPS.—If the second deck from the keel in a two-deck vessel consists of several partial decks, extending with breaks from the stem to the stern, the line of that course of decks must be taken as the tonnage deck; and if the partial decks are at different heights the line of the lowest flat will be taken as the tonnage deck, and the headroom above such line and under the higher flats will be measured and added as inclosures above decks.

3. BREAKS—DEFINITION OF.—A break is the space above the line of the deck when that deck is cut off and continued at a higher elevation. The height of a break is the distance from the underside of the deck cut off to the underside of the break deck.

4. BREAKS IN INNER BOTTOM.—When it is necessary to establish the below-deck volume of a vessel with an irregular or broken inner bottom, the length of the ship should be divided into sections of lengths equal to the unbroken portions of the inner bottom lines, and after subdividing each of such sections into parts, according to the class under which the sections respectively belong, the volume of each should be calculated separately, in such manner as to determine, as exactly as possible, the volume of the hold. Where lengths of sections are 30 feet or under, they may be divided into two equal parts. When the underdeck tonnage is measured in parts in consequence of a break or breaks in the double bottom, the tonnage depth at the middle of the tonnage length will determine the number of parts into which the remaining depths are to be divided.

5. SPRING OF BEAM.—The round or spring of the beam is the perpendicular distance from the crown of the underside of the deck plank or plating at center to a line stretched athwart the vessel from end to end of the top of the beam, and it is to be ascertained at every place where it is to be used in the measurement.

6. HALF BREADTHS AT SIDE.—If there be no ceiling, plating, or planking on the inside of a ship's frames, the half breadths shall be taken to the inside of the frame members.

7. LOWEST BREADTHS ON SECTIONS.—The bottom widths are to be taken only so far as the apparent flat of floor extends. Where there is a perceptible rise immediately from the keel, the bottom widths should be taken equal to the width of the keelson and no compensation made for the rise of floor or turn of the bilge.[1]

8. WEB-FRAME CONSTRUCTION.—For ships constructed with web frames, at intervals of the length, the measurements should be taken to the interior faces of the ordinary frames, ignoring the greater depth of the web-frame construction.

9. BATTENS OR SPAR CEILING.—When the ceiling of a hold or other space is open in construction and consists of battens spaced apart, the breadths should be taken to the inside of the average thickness of battens between points of measurement.

10. INSULATION FOR REFRIGERATION.—When a ship's compartments are insulated for refrigerating or other purposes and the insulating material extends inboard of the frames or above the tops of floors or inner bottom, the half breadths and heights shall be taken to the inside of the average thickness thereof.

11. TONNAGE SECTIONS OF IRREGULAR FORM.—When any tonnage section is of such an irregular form, due to peculiar arrangement of the inner bottom or to any other cause, that the area will not be correctly produced by the ordinary method, such irregularities may be figured and added to or subtracted from the area found by the prescribed process, as the case may be.

12. VOLUME OF RAM BOW.—That portion of a ship forward of the No. 1 tonnage section, known usually as the ram bow, and fitted with plate framing in which lightening holes are cut, shall be figured and added to the gross tonnage, but the breadths shall be taken to lines representing the inboard sides of frames of the same depths as those used in the forward end of the ship adjacent this space. The same method shall apply in the case of a projecting stern.

13. CEMENT IN TONNAGE SPACES.—Where quantities of cement are used in a ship's compartments, the volumes of the spaces are to be figured to the framing of the ship, as if the cement were not present.

14. BALLAST TANKS NOT INNER BOTTOM.—Peak tanks are not to be in any case exempt from measurement, and side ballast tanks are to be included in the gross tonnage, except when built without the inside of the framing of the ship; such, for instance, as the "Raylton Dixon system" of topside tanks, which may be exempted provided they are not used for cargo, stores, or fuel.

15. FEED WATER AND FUEL OIL IN BOTTOMS.—Spaces in the double bottoms made tight for reserve feed water or fuel oil are to be exempted from measurement just as is done in the case of ordinary water bottoms for ballast water.[2]

16. COFFERDAMS.—The cofferdams above the protective deck and in general are not to be considered exempted spaces, but are to be measured and included in the gross figures, except when actually forming a continuation of the inner bottom and when not used for cargo, stores, or fuel, cellulose being considered cargo in warships.

[1] Attention is called to the English merchants shipping act of 1894 as revised (see Instructions Relating to the Measurement of Ships, ed. 1913, p. 67; also par. 118, p. 43, and par. 24, p. 11), showing their method of calculating volume below decks in ships with a rise of floors.

[2] The Suez Canal authorities reserve the right to alter their ruling in this connection, after careful consideration of the various types of bulk oil carriers. The double-bottom spaces will be taxed when they are utilized for carrying oil during transit of the canal. Contrary, however, to the rules actually in force, this taxation will not be of a permanent character, and the said spaces will not be taxed when they are not utilized.

17. Space at after end of shaft tunnel.—The compartments through which the shaft tubes pass, abaft the tunnel and forward of the stuffing box, sometimes known as the stuffing-box compartment, will not be exempted in the figuring of tonnage, unless such space is made water-tight and forms the only inner bottom in the location considered. When forming a part of the after peak-tank space, it is not to be exempted space.

18. Between deck, poop, and forecastle lengths.—When taking measurements for lengths to the bow or stern on ships where framing is present instead of stem or sternposts, such measurement shall be taken at half the height of space concerned and to the inside of the frame, but when ceiling is fitted the length shall be taken to the inside of the average thickness thereof.

19. Heights between decks.—In figuring the capacity of spaces where there occur several thicknesses of deck covering, the height shall be taken from the underside of the deck above to the average thickness of such deck planks or plates and coverings thereon as may be: *Provided*, The deck lines of the bounding decks are parallel or crowned to the same camber; otherwise the correction for difference in camber shall be made.

20. Between-deck spaces with breaks in sides.—When figuring a space where gun sponsons, reentrant ports, or other breaks in the topside occur, the ordinates shall be taken to a line formed by a continuation of the inside line of the frames or the ceiling thereon; the volumes of the breaks shall then be calculated and added to or subtracted from the figure thus found; the result shall be considered the volume of such space.

21. Shelter decks and upper decks—Difference between.—Whether for the purpose of measurement a deck is to be regarded as an upper deck or as a shelter to an upper deck is to be determined in each instance, both by the character and structural conditions of the erection and by the purpose to which the between deck is devoted. If the deck is a continuous deck, fastened down and watertight, sealing up the cylinder formed between the two decks, and making it a fit place for the stowage of cargo, like a hold, the deck is to be treated as an upper deck, and the space between it and the deck below is to be measured. If, however, the cylinder is open to the shipment of seas and the space is not reasonably fit for the carrying of dry cargo but is used only for cargo generally classed as "deck loads," such as cattle, horses, chemicals, oil in barrels, etc., then, usually, the deck is to be regarded as a shelter deck and the space as "sheltered space above the upper deck, which is under cover and open to the weather—that is, not inclosed"—and is not to be included in the recorded tonnage.

22. Definition of closed-in spaces.—By "closed-in spaces" is to be understood spaces which are inclosed and protected from the action of the weather, even though large openings be left in the inclosure, and care will be taken that the intent of the law in this respect is not evaded.

23. Permanent erections.—Poops, bridge houses, pilot houses, steering screens, or other permanent erections, entirely or partially open at sides or ends or with one or more openings in the sides, ends, or in the covering deck, and not fitted with doors, hatches, or other means of closing them, or which may not be easily closed in, shall not be included in the gross tonnage, except when the spaces therein are available or actually fitted or used for cargo, stores, passengers, or crew, when they must be measured and form a part of the gross tonnage of the ship. This section must not be confounded with that portion of the rules referring to shelter or awning decks or to deck loads.

24. Open-deck spaces for berthing.—Spaces under shelter decks, such as those under bridges, etc., which are not inclosed or readily inclosed, but are fitted with hammock hooks for berthing accommodations, shall not form a portion of the gross tonnage.

25. Deck erections—Dimensions to framing.—In all cases the interior dimensions of deck spaces and erections shall be taken to the ceiling where such exists, but in the absence thereof to the interior edge of the frames or supports for the walls of these spaces. Stiffeners on bulkheads shall be considered as supports, even though not connected to the beam above or deck below.

26. Deck erections of irregular form.—When deck spaces have irregular form, such that the general formula, indicated for the measuring of deck spaces, can not be applied to give correct results, the spaces should be subdivided into smaller portions, and each of these measured by the most convenient geometrical formula adapted thereto.

27. Hammock houses and berthing.—All closed hammock houses and closed or readily closed hammock berthing forming erections above decks shall be figured in the gross tonnage.

28. Miscellaneous spaces.—Ammunition hoists above decks, turrets, and barbettes, conning and signal towers, inclosures of windlass, steering gear, and other spaces for working the ship, and all other such miscellaneous spaces, if within the regulations pertaining to permanent erections, shall form a part of the gross tonnage of a ship, but masts, vents, and cowls, open hammock berthings, etc., are not to form a part of such gross figure.

29. Companion hatches, skylights, and access trunks above decks.—Companion hatches, skylights, and access trunks above decks are not to be considered under the head of hatches, but are to be ignored in the gross tonnage of a ship, except when used as striking-down hatches and directly connected with or trunked down to spaces where stores or cargo are stowed. When a companion house is used as a smoking room, for instance, for the accommodation of passengers it is to be included in the gross tonnage under the head of deck houses.

30. Hatches for coal passing.—In considering the volume of hatches (in excess of one-half per cent gross) the coal hatches or skylights for striking down bunker coal are not to be included. All such hatches shall be omitted from the gross figure, except in cases where they are trunked down to the bunkers, when they will be included in the gross and will form a part of the machinery deduction.

31. Light and air spaces for machinery.—The closed or readily closed spaces for light and air or hot-air escape from machinery spaces on or above the upper deck shall be considered a part of and figured in the gross tonnage on approval of the request to the Commissioner of Navigation, but such spaces are in no case to be classed under hatches unless used for striking down stores or cargo.

NET TONNAGE

In procuring the net tonnage of any United States naval ship for Suez Canal tolls the deductions as permitted by the canal authorities and appearing in the "Regulations for the Navigation of the Suez Maritime Canal" (ed. Jan., 1924), of which the articles below are extracts, shall be followed.

DEDUCTIONS TO BE MADE FROM THE GROSS TONNAGE IN ORDER TO ASCERTAIN THE NET TONNAGE

ART. 11. To find from the gross tonnage of vessels as above set forth the official or net registered tonnage, either for sailing vessels or for steamships, the following mode of operation must be resorted to:

SAILING VESSELS

1. ART. 12. For sailing vessels deduct the spaces exclusively and entirely occupied by the crew and the ship's officers, those taken up by the cookhouse and latrines exclusively used by the ship's officers and crew, whether they be situated above or below the upper deck; the covered and closed-in spaces, if there be any situated on the upper deck, and used for working the helm, the capstan, the anchor gear, and for keeping the charts, signals, and other instruments of navigation.

2. Each of the spaces deducted as above may be limited according to the requirements and customs of each country, but the deductions must never exceed in the aggregate 5 per cent of the gross tonnage.

3. The company allows the following spaces to be included in the deductions specified in article 12 of the regulations for the measurement of tonnage, provided the deductions do not in the aggregate exceed 5 per cent of the gross tonnage:

(*a*) The chart room, even when also used as a captain's cabin. When, however, the captain's accommodation comprises several rooms, one of which is the chart room, that room alone is deducted; but in all cases the room used as the chart room must, if it is to be deducted, be situated on the upper deck.

(*b*) The cabins of the ship's doctors, if actually occupied by them.

(*c*) A mess room, if there is one, for the exclusive use of the officers and engineers; or, if they exist, two mess rooms—one of them for the exclusive use of the officers, the other one for the exclusive use of the engineers.

A mess room, if there is one, for the exclusive use of the petty officers.

No deduction is allowed for the officers' mess room in ships having passenger accomodations which are not also provided with a passengers' mess room.

(*d*) All spaces fitted as bathrooms or lavatories for the exclusive use of the ship's officers, engineers, and crew, with the exception of such of the said bathrooms as are available for passengers when no bathroom for their exclusive use is provided.

(*e*) All spaces specially provided for the storage of searchlights, the wireless telegraphy installation, and the operator's berth, on condition that they are situated on the upper deck.

4. The above-specified spaces can only be deducted if they bear a distinctly visible and permanent indication of their exclusive appropriation.

5. Closed spaces for the use or possible use of passengers will not be deducted from the gross tonnage.

6. ART. 13. The measurement of these spaces is to be effected according to the rules set forth for the measurement of covered and closed-in spaces on the upper deck; the result, obtained by deducting the total of such allowances from the gross tonnage, represents the net or register tonnage of sailing vessels.

STEAMSHIPS

1. ART. 14. For vessels propelled by steam or any other mechanical power deduct: (*a*) The same spaces as for sailing vessels (art. 12) with the limitation to 5 per cent of the gross tonnage. (*b*) The spaces occupied by the engines, boilers, coal bunkers, shaft trunks of screw steamers, and the spaces between decks and in the covered and closed-in erections on the upper deck surrounding the funnels and required for the introduction of air and light into the engine rooms and for the proper working of the engines themselves. Such deductions can not exceed 50 per cent of the gross tonnage.

2. ART. 15. The measurement of the spaces allowed for both in sailing vessels and in steamships (sec. 1 of art. 14) is to be effected according to the rules set forth in articles 12 and 13 for sailing vessels.

3. Spaces for which allowances are made in steamships only (sec. 2 of art. 14) are measured according to the following rules:

(*a*) *Ships having coal bunkers with movable partitions*

ART. 16. In ships that do not have fixed bunkers, but transverse bunkers with movable partitions, with or without lateral bunkers, measure the space occupied by the engine rooms and add to it for screw steamers 75 per cent and for paddle steamers 50 per cent of such space.

By the space occupied by the engine rooms is to be understood that occupied by the engine room itself and by the boiler room, together with the spaces strictly required for their working, with the addition of the space taken up by the shaft trunk in screw steamers and the spaces between decks which inclose the funnels and are necessary for the admission of air and light into the engine rooms.

These spaces are measured in the following manner: Measure the mean depth of the space occupied by the engines and boilers from its crown to the ceiling at the limber strake, measure also three, or, if necessary more than three, breadths of the space at the middle of its depth, taking one of such measurements at each end and another at the middle of the length; take the mean of such breadths; measure also the mean length of the space between the foremost and aftermost bulkheads or limits of its length, excluding such parts, if any, as are not actually occupied by or required for the proper working of the engines and boilers. Multiply together these three dimensions of length, breadth, and depth, and the product will be the cubical contents of the space below the crown. Then find the cubical contents of the space or spaces, if any, between the crown aforesaid and the uppermost or poop deck, as the case may be, which are framed in for the machinery or for the admission of light and air, by multiplying together the length, depth, and breadth thereof. Add such contents as well as those of the space occupied by the shaft trunk to the cubical contents of the space below the crown; divide the sum by 100 or by 2.83, according as the measures are taken in feet or meters, and the result shall be deemed to be the tonnage corresponding to the engine and boiler room which serves as basis for the deductions referred to.

If in any ship in which the space aforesaid is to be measured the engines and boilers are fitted in separate compartments, the contents of each shall be measured separately in like manner, according to the above rules, and the sum of their several results shall be deemed to be the tonnage of the engine rooms which serves, as aforesaid, as basis for the total deductions.

(*b*) *Ships with fixed coal bunkers*

ART. 17. In ships with fixed coal bunkers measure the mean length of the engine and boiler room, including the coal bunkers. Ascertain the area of three transverse sections of the ship (as set forth in the rules given in arts. 3 and 4 for the calculation of the gross tonnage) to the deck which covers the engine.

One of these three sections must pass through the middle of the aforesaid length and the two others through the two extremities.

Add to the sum of the two extreme sections four times the middle one and multiply the sum thus obtained by the third of the distance between the sections. This product divided by 100, if the measurements are taken in English feet, or 2.83 if they are taken in meters, gives the tonnage of the space in question.

If the engines, boilers, and bunkers are in separate compartments, they are separately measured, as above set forth, and the results are added together.

In screw steamers the contents of the shaft trunk are measured by ascertaining the mean length, breadth, and height, and the product of the multiplication of these three dimensions divided by 100 or 2.83, according as the measurements are taken in English feet or in meters, gives the tonnage of such space.

The tonnage of the following spaces between decks and in the covered and closed-in erections on the upper deck is ascertained by the same method, viz: (*a*) The spaces framed in around the funnels. (*b*) The spaces required for the admission of light and air into the engine rooms. (*c*) The spaces, if there are any, necessary for the proper working of the engines.

4. ART. 18. Instead of the measurement of fixed bunkers, the rules for bunkers with movable partitions as set forth in article 16 may be applied.

5. ART. 19. In the case of tugs the allowances are not limited to 50 per cent of the gross tonnage; all spaces occupied by machinery, boilers, and coal bunkers may be deducted. Nevertheless, if such vessels are not exclusively employed as tugs, the deductions in question can not exceed 50 per cent of the gross tonnage.

6. The determination of deductions for coal spaces may be effected either by the rules of the European Danube Commission of 1871 or by the exact measurement of fixed bunkers.

INSTRUCTIONS AND DEFINITIONS AS TO NET TONNAGE

1. DEDUCTIBLE SPACE.—No space will be deducted from the gross tonnage in ascertaining the net tonnage unless it has been first included in the gross figure.

2. GENERAL DEDUCTIONS FOR QUARTERS.—All spaces for the exclusive use of the persons duly inscribed on the ship's list, with the exception of those for the commanding officer, are deductible within the reserve of the maximum allowance of 5 per cent of the gross tonnage for the total of deductions other than for propelling machinery.

3. INTERPRETATION OF RULES RELATIVE TO PASSENGERS, ETC.—Inasmuch as ships of the Navy are not engaged in commercial pursuits or fitted up for the transportation of persons unidentified with the ship's company for pecuniary gain, the fact that a passenger or passengers are forced to use spaces intended for use of and assigned to officers shall not prevent the inclusion of such spaces in the deductions, but in general no deductions are to be made for spaces assigned to the accommodation of passengers.

4. DEFINITION OF PASSENGERS.—The admiral, his chief of staff, and flag lieutenant shall be considered passengers, as shall also officers, enlisted men, or other persons who may be aboard of but not assigned to duty with a transport, hospital ship, etc.; that is, all persons not duly inscribed on the ship's list are passengers.

5. CARGO OR STORES IN QUARTERS.—Every space occupied by officers or crew as living spaces or appropriated for their use and deducted therefor shall be kept free from stores and merchandise of any kind, not being the personal property of those occupying such spaces, and no passengers shall be accommodated therein.

6. DEFINITION OF CARGO.—On ships of war the term "cargo" shall include armament, ammunition, and military and naval equipment; on transports, food, stores, luggage, accouterments, and equipment for passengers; on hospital ships, food stores for passengers, medical stores, and hospital equipment; on colliers, cargo coal and coaling gear; on repair ships, tools, parts for repairs and repair equipment; on ammunition ships, arms, ammunition, etc.; supply and refrigerator ships, cargo stores, etc.; tank steamers, cargo fuel oil; and on distilling ships, distilling machinery and distilled water.

7. CREW'S BERTHING SPACES.—The deductions for crew's spaces are governed by the following principles: When the greater part of a closed-in space is occupied by the mess tables, hammocks, and men's

quarters, its entire area, after omitting ventilating shafts, if any, cabins, companion ways, etc., is to be deducted from the gross tonnage: *Provided*, That such parts of the space as are not occupied by mess tables, hammocks, etc., are not of such dimensions as to be available for other purposes. In the case of larger spaces, serving other purposes than as living quarters for the crew—e. g., for gun and torpedo armaments and in which hammocks and mess gear are distributed over the whole space—only that part is to be considered crew's space which is occupied by mess gear, hammocks, and crew's gear, inclusive of the space required for the use of the tables and benches. In general, only such portions of crew's spaces as are actually occupied and used by crew shall form the crew's deduction.

8. CREW'S SPACES NOT FITTED FOR BERTHING.—When spaces are occupied by lockers, mess tables, or other gear for the crew but are not fitted for berthing, they shall form a part of the crew's deduction, provided they are used for no other purpose than the crew's accommodation.

9. CREW'S SPACES ON OPEN DECKS.—When crew's hammocks are swung on open or under shelter decks—as, for instance, under bridges, etc., open at sides or ends—no deductions shall be made unless the spaces in which such accommodations exist have been previously included in the gross figure.

10. HAMMOCK HOUSES AND HAMMOCK BERTHING FOR CREW.—Hammock houses and hammock berthing which is closed or readily closed shall form a part of the crew's berthing deduction, provided, however, such spaces shall have first been included in the gross tonnage.

11. STEWARDS, COOKS, AND MESSMEN.—Passengers, stewards, cooks, and messmen are not considered part of the crew on passenger steamers. On troopships, transports, or other naval auxiliaries stewards, etc., who are regularly listed on the ship's complement may be deducted for, even though at times used in the service of passengers, but in cases where such service of passengers is performed by servants shipped for the purpose no deduction shall be made. On warships (which invariably carry no passengers except official representatives of the Government) the messmen, etc., shall be considered as forming a part of the crew, and their spaces shall be deducted for.

12. CAPTAIN'S QUARTERS.—The captain's quarters, when below decks, are not to be deducted for, and when above decks only such portion thereof as is used as a chart room is to form a deduction, even though permitted as a deduction in the register tonnages of some nations.

13. PASSAGES AND OFFICER'S COUNTRY.—Where open spaces known as country or passage, are fitted with hammock hooks, lockers, etc., for the use of officers or crew they shall be deductible as berthing spaces, but otherwise such spaces shall form no part of the deduction, except when forming passages exclusively for access to deductible spaces.

14. GALLEYS, BAKERIES, SCULLERIES, AND PANTRIES.—Under the heading of "Cookhouse deduction" the galleys, bakeries, sculleries, and pantries, except spaces especially assigned to the commanding officer or fleet officers, may be included, provided they are used in the preparation of food for persons duly inscribed on the ship's list.

Galleys, etc., for the accommodation of passengers will not be deducted.

15. Bathrooms, lavatories, etc.—All latrines, lavatories, bathrooms, showers, urinals, and water-closets shall be deducted for, except those provided for the use of the captain or fleet officers and those assigned to passengers.

16. Mess rooms.—All mess rooms provided for persons duly inscribed on the ship's list, except the captain or fleet officers, shall form deductible space, but no passengers' mess rooms shall be deducted.

17. Sick bay, dispensary, and sick-bay bath.—Any spaces provided for the medical attention of the officers and crew of a ship are to form a part of the deductions thereon, but in the case of a hospital ship having spaces fitted for the transportation or treatment of others than those duly listed on the ship's complement no such deductions shall be made therefor.

18. Doctor and medical attendants.—The accommodation for the doctors, apothecary, and sick attendants shall form a part of the deductions, even in cases of hospital ships, when they are duly inscribed on the ship's list.

19. Spaces for working ship.—The windlass house, steering-gear space, conning towers, lookout houses, pilot houses, capstan spaces, signal spaces, wireless rooms, etc., shall be deducted when located above the deck covering the highest between deck, or when, perhaps, under a simple shelter deck; but when below decks such spaces are not to be deducted.

20. Donkey boiler and engine.—The donkey boiler and engine, when in an inclosed space above decks and when connected up with any or all of the auxiliaries—for instance, pumps, steering gear, anchor gear, windlass, capstan, etc.—is to be deducted; but when also used for the purpose of hoisting cargo, as in some merchant ships, it does not form deductible space, except in the case of men-of-war or troop ships, which do not carry cargo for commercial purposes.

21. Steering-engine spaces and windlass-engine spaces.—The spaces for the steering and windlass engines, etc., are to form a part of the miscellaneous deductions for working the ship, provided they are situated above the uppermost deck; and if located in open space and not bulkheaded off a maximum space of 3 feet on each side for access and attendance will be permitted.

22. Signal spaces and lamp room.—Signal towers or inclosed signal stations above decks may be deducted when used only for signals or signal apparatus connected with the ship, and when the lamp room is above and used for signal lamps only the same may be deducted under this heading.

23. Ballast tanks.—Peak tanks and side ballast tanks are in no case to be deducted from the gross tonnage, although such deductions are permitted in the national tonnage of several countries, but in certain cases topside tanks form exempted space.

24. Sail rooms and boatswain's stores.—Sail rooms and boatswain's stores do not form deductible spaces under these regulations, even though they be deducted for under the national tonnages of the several countries.

25. Cleaning-gear spaces.—The places provided for the stowage of deck gear and other articles used in cleaning the ship are not to form a part of the deductions under these rules.

26. Laundry, ice machine, and refrigerator spaces.—Laundries, ice machines, and refrigerator spaces are not to form a part of the deductions under these rules, even though provided only for the officers and crew.

27. Offices and storerooms.—Offices provided on a ship for the transaction of routine business, except, perhaps, the doctor's office, are not to be deducted for, and no storerooms are to form a deduction, except, possibly, the navigator's and signal storerooms, and then only when above decks.

28. Prisons and band rooms.—Prisons and band rooms do not usually form deductible space. When the band room is fitted up for the berthing, messing, or living quarters of the band, a deduction may be made for such portions thereof as are so used.

29. Propelling-power deduction.—In ascertaining the amount of deduction for propelling power, whichever of the rules[3] (*a*) or (*b*) produces the greater deduction for propelling power shall be used.

(*a*) The actual engine, boiler, shaft alley, and light and air spaces as measured, plus 75 per cent of these spaces for screw steamers and plus 50 per cent for paddle steamers; or (*b*) the actual measurement of the above spaces, plus the actual measurement of the permanent bunkers, which can not be extended or increased in size.

30. Motive power other than steam.—In ships provided with motive power other than steam the machinery spaces shall be measured and deducted under Article 14 of the Suez rules.

31. Goods or stores in machinery spaces.—No goods or stores shall be carried in any spaces measured and deducted for propelling power; but spare parts, tools, oil, waste, and the like may be carried in machinery spaces, provided they are not within bulkheaded spaces, separated off from the machinery space proper.

32. Cabins or storerooms in machinery spaces.—When cabins, engineers' storerooms, etc., are located in machinery spaces, they shall not form a part of the propelling-power deductions, but shall be omitted therefrom.

33. Engineers' workshop, dynamos, and distillers.—The engineers' workshop, dynamos, and distillers are not to form a part of the propelling-power deductions in a steamship unless located directly in a machinery space and not bulkheaded off therefrom; but when a distiller is used only for the preparation of potable water for the crew and not used for making steaming water the space therefor may be deducted under the 5 per cent reserve clause for miscellaneous spaces.

34. Crank pits and pockets.—All crank pits, pockets, etc., for main and auxiliary machinery in the engine and boiler rooms shall form a part of the propelling-power deductions.

35. Auxiliary machinery in propelling-power spaces.—When auxiliary machinery is located in the propelling-power spaces it shall be included in the deduction for the propelling-power but shall not be entitled to a separate deduction under any other head.

[3] The Danube rule.

36. DONKEY BOILER IN PROPELLING SPACE.—If the donkey engine and boiler are within the boundary of the machinery space and are used in connection with the main machinery, they are to be included in the propelling-power deduction, and the space occupied by them shall not be entitled to a separate deduction in addition.

37. MACHINERY OR FITTINGS IN FIDLEYS.—Whenever machinery or fittings are located in the engine or boiler room uptake casings and no bulkhead incloses them except the casings bulkhead, the whole or entire volume of these uptake spaces shall form a portion of the deduction for propelling power, but when the auxiliary machinery is bulkheaded off from the rest of the space such portions as may have been inclosed for such machinery or fittings shall not form a portion of the propelling-power deduction.

38. ENGINE AND FIREROOM BLOWER.—When blowers for machinery spaces are located in, or are in a compartment adjacent to, the machinery spaces they shall form a part of the machinery deduction of the ship; in general, all spaces for the ventilation of machinery compartments situated below the upper deck are considered as forming a part of the propelling-power deduction.

39. AIR CASINGS.—When machinery spaces are fitted with air casings, the air spaces are to be included in the propelling-power deductions, as they form part of the ventilation of such spaces.

40. LIGHT AND AIR CASINGS NOT EXTENDING TO TOP OF INCLOSED SPACE.—Whenever, in the case of an otherwise inclosed superstructure, large but readily closed openings surrounding the funnels are provided in the cover deck and the entire volume of such space is figured in the gross tonnage, only such portions of the light and air casings from the boiler and engine rooms as may actually extend into such spaces shall be figured in the propelling-power deductions.

41. LIGHT AND AIR SPACES ABOVE DECKS.—All portions of light and air spaces to propelling machinery up to the gratings or plates covering them are to be included in the machinery deduction, even such portions as extend above the deck inclosure, provided they have been included in the gross tonnage.

42. MOVABLE BUNKERS.—When the "Danube rule" is not used, but actual bunker space as well as actual machinery is measured and deducted, the bunkers are to be measured separately and added together, but none are to be included in such deductions which can in any way be extended or increased in volume by the means of movable partitions or bulkheads. On colliers no part of the space assigned to cargo is to form a part of the deduction for bunker coal.

43. METHODS OF TAKING MEASUREMENTS IN BUNKERS.—When using actual volume of bunkers for fuel deductions, the measurements are to be taken to the underside of deck and inside of frames and not to underside of beams and outside of frames as are required in standard bunker capacities.

44. COAL TRUNKS.—All fixed coal trunks shall be considered as having been included in the 75 per cent space deduction for fuel when using the "Danube rule," but when the actual capacity of the fuel spaces is used the coal trunks and chutes are to be figured and added thereto as forming a part of the fuel space.

45. FUEL-OIL TANKS.—When part of the double bottom is fitted up for the carrying of oil fuel for the ship's fires in an ordinary coal-burning vessel, no deduction shall be made for such space, since it is exempted space not measured for gross tonnage, but in cases of oil-burning ships the fuel tanks thereof, except double-bottom tanks, shall be considered as fuel compartments and figured in the propelling power deduction similarly to coal bunkers.

46. SHAFT TUNNELS WITH A RAISED FLAT UNDER.—The deductions for shaft alleys in cases where a shaft alley flat is fitted above the inner or outer bottom plating should not include the space below such flat but should be measured only to the floor plates thereof, provided such plates, although nonwater-tight, form a complete floor for the compartment. In other cases figure to the bottom of the compartment as if the incomplete flat were not fitted.

47. SHAFT TUNNELS NOT CLEARLY DEFINED.—When shaft tunnels are not clearly defined by bulkheads and the ship is more or less open, only such portions as are necessary about the shaft and thrust block shall constitute a deduction. The thrust-block space should be taken of such length and breadth as to admit of a man's getting around it to remove the holding-down bolts, and the height shall not exceed 7 feet except when more space is absolutely necessary. The shaft space need not exceed 6 feet headroom and 3 feet passage on one side with clearance on the other side. When the ship is open from side to side and the space abaft the engine room through which the shafts pass is used for cargo stores, etc., no deduction shall be made.

METHOD OF PROCEDURE

In figuring the Suez tonnage of any vessel the mode of procedure, after the necessary finished plans, lines, and mold loft dimensions are in hand, shall be as follows:

1. Ascertain what spaces are exempt from measurement, if there are any, and what deck constitutes the tonnage deck.
2. Make sketch of stem and stern contours and obtain the below and between deck lengths.
3. Lay out below and between deck sections at the proper stations and figure offsets and heights thereon as may be necessary for obtaining areas.
4. Calculate the below-deck volume, omitting exempted spaces, and including necessary appendages.
5. Figure volume of between-deck spaces from areas found.
6. Figure deck erections coming within the requirements from detail sketches if necessary.
7. Obtain volume of hatches in excess of one-half of 1 per cent of above spaces.
8. From above volumes obtain the "gross Suez Canal tonnage."
9. Determine volume of the spaces assigned to crew's and officers' berthing, and also such other miscellaneous spaces as may be properly deductible up to 5 per cent of the gross figure and deduct the same.
10. Lay out such sketches as may be necessary and calculate the volume of the machinery spaces.
11. Determine from the types and capacities of the several bunkers whether the "Danube rule" or actual bunker capacity is to be used in the propelling-power deduction.
12. Obtain the propelling-power deduction up to a maximum figure of 50 per cent of the gross tonnage.

13. Deduct the propelling-power figure from that found after deducting for berthing, etc., and secure the "Net Suez Canal tonnage."

CLASSIFICATION OF ITEMS ON CERTIFICATE

1. Gun turrets and barbettes are to appear under the heading "Roundhouses" when entering volumes in the certificate.
2. Closed hammock berthing (when above decks) shall be included under the heading "Side houses."
3. Light and air spaces to machinery (when extending above decks) shall appear under "Spaces necessary for working the ship."
4. "Berthing accommodations of crew" is to include only berthing and messing spaces therefor.
5. "Berthing accommodations of officers" is to include staterooms, doctor's cabin, and officers' mess rooms, bathrooms, lavatories, water-closets, etc.
6. The miscellaneous deductions are to include galleys, crew's water-closets and wash rooms, sick bays, and such properly deductible spaces as may be necessary for working the ship.
7. The "Engine room as measured" shall include that portion of "light and air spaces for machinery" which extends above decks.

RÉSUMÉ

The gross tonnage for the Suez Canal shall include:

1. (*a*) Space below the tonnage deck, except exempted space; (*b*) space forward of No. 1 ordinate, in the bow; (*c*) space abaft the last ordinate, in the stern.
2. Space between decks, above tonnage deck.
3. Spaces above uppermost complete deck (if closed in or readily closed), as follows:

1. Poop.
2. Bridge space.
3. Forecastle.
4. Turtlebacks and hoods.
5. Breaks in decks.
6. Turrets.
7. Barbettes.
8. Gun sponsons.
9. Gun housings.
10. Torpedo housings.
11. Ammunition hoists.
12. Range-finding stations.
13. Directing stations.
14. Engineer's workshops.
15. Carpenter shop.
16. Blacksmith shops.
17. Laundries.
18. Drying rooms.
19. Ice-machine spaces.
20. Dynamo rooms.
21. Distiller rooms.
22. Conning towers.
23. Signal towers.
24. Lookout houses.
25. Lamp rooms.
26. Pilot houses.
27. Steering-gear spaces.
28. Steering-engine rooms.
29. Windlass houses.
30. Chain lockers.
31. Winch houses.
32. Capstan houses.
33. Donkey engine and boiler houses.
34. Chart houses.
35. Closed steering screens.
36. Wireless rooms.
37. Searchlight houses.
38. Storerooms.
39. Prisons.
40. Band rooms.
41. Deck-gear spaces.
42. Offices.
43. Staterooms.
44. Mess rooms.
45. Saloons.
46. Smoking rooms.
47. Companion houses.
48. Hammock houses.
49. Hammock berthing.
50. Crew's quarters.
51. Officers' quarters.
52. Captain's quarters.
53. Admiral's quarters.
54. Fleet staff's quarters.
55. Passengers' quarters.
56. Servants' quarters.

57. Sick bay.
58. Dispensary.
59. Medical attendants' quarters.
60. Galleys.
61. Bakeries.
62. Pantries.
63. Sculleries.
64. Water-closets.
65. Urinals.
66. Latrines.
67. Bathrooms.
68. Showers.
69. Lavatories.
70. Wash rooms.
71. Water-tank compartments.
72. Cofferdams.
73. Cargo spaces.
74. Light and air spaces for machinery.
75. Coal bunkers and trunks.
76. Cargo hatches in excess of one-half of 1 per cent gross.

The following spaces are exempted from measurement:

1. The double bottoms, except peak tanks.
2. Side ballast tanks, provisionally.
3. Masts above decks.
4. Vents and cowls above decks.
5. Open steering screens.
6. Companion hatches.
7. Skylights.
8. Tanks on deck, not part of hull structure.
9. Lockers on deck, not part of hull structure.
10. Spaces under open shelter decks.
11. Spaces for "deck loads."
12. Spaces not inclosed or readily inclosed.

The following spaces may be deducted in securing the net tonnage, up to a maximum of 5 per cent of the gross:

(*a*) Only if above deck—

1. Navigator's storeroom.
2. Conning towers.
3. Lookout houses.
4. Signal houses.
5. Pilot houses.
6. Closed steering screens.
7. Windlass houses.
8. Chain lockers.
9. Winch houses.
10. Capstan houses.
11. Donkey boiler and engine space, provisionally.
12. Chart houses.
13. Steering-gear spaces.
14. Steering-engine rooms.
15. Wireless houses.
16. Searchlight spaces.
17. Lamp rooms for signals.

(*b*) Whether situated above or below decks—

1. Crew's berthing and messing and living spaces wherever located.
2. Officers' berthing and messing and living spaces wherever located.
3. Cooks', servants', etc., quarters, provisionally.
4. Doctors', medical attendants', and apothecary's quarters.
5. Sick bays, except on hospital ship.
6. Dispensaries, except on hospital ship.
7. Doctors' offices.
8. Galleys, except passengers', captain's, and fleet officers'.
9. Bakeries, except passengers', captain's, and fleet officers'.
10. Pantries, except passengers', captain's, and fleet officers'.
11. Sculleries, except passengers', captain's, and fleet officers'.
12. Mess rooms, except passengers', captain's, and fleet officers'.
13. Water-closets, except passengers', captain's, and fleet officers'.
14. Urinals, except passengers' captain's, and fleet officers'.
15. Latrines, except passengers', captain's, and fleet officers'.
16. Bathrooms, except passengers', captain's, and fleet officers'.
17. Showers, except passengers', captain's, and fleet officers'.
18. Lavatories, except passengers', captain's, and fleet officers'.
19. Wash rooms, except passengers', captain's, and fleet officers'.
20. Hammock berthing.
21. Hammock houses.
22. Condenser space—crew's drink only.

The following spaces shall not form a part of the deductions from the gross, which are under the restriction of the 5 per cent clause:

1. Turrets.
2. Barbettes.
3. Gun sponsons.
4. Gun and torpedo housings.
5. Ammunition hoists.
6. Range-finding and directing stations.
7. Armories.
8. Workshops.
9. Ice-machine spaces.

10. Dynamo rooms.
11. Distiller spaces, except as above.
12. Laundries.
13. Drying rooms.
14. Cargo-hoist spaces.
15. Open steering screens.
16. Storerooms.
17. Boatswains' stores.
18. Sail rooms.
19. Prisons.
20. Band rooms (unless quarters).
21. Deck gear spaces.
22. Offices.
23. Water-tank compartments.
24. Peak tanks.
25. Topside tanks.
26. Cofferdams.
27. Cargo spaces.
28. Captain's quarters, except chart rooms.
29. Admiral's quarters.
30. Fleet staff's quarters.
31. Passengers' quarters.
32. Passengers' servants' quarters.
33. Passengers' luggage rooms.
34. Passengers' water-closets, lavatories, etc.
35. Passengers' mess rooms and saloons.
36. Smoking rooms.
37. Companion houses.
38. Hospitals and dispensaries on hospital ships.
39. Engineers' machine shops.
40. Refrigerator spaces.
41. Cargo spaces.
42. Passages, except when forming necessary access to deductible spaces.
43. Open country.
44. Double bottoms.
45. Masts.
46. Vents and cowls.
47. Companion hatches.
48. Skylights.
49. Open spaces for deck loads.
50. Spaces under shelter decks.

The following spaces shall be included in the propelling power deduction, the total of which shall not exceed 50 per cent of the gross tonnage:

1. Engine room.
2. Crank pits.
3. Pump pockets in machinery spaces.
4. Air locks.
5. Vent spaces and trunks for machinery spaces.
6. Boiler rooms.
7. Blower rooms for forced draft.
8. Shaft alleys.
9. Thrust block pockets.
10. Donkey boiler and engine spaces, provisionally.
11. Fidleys.
12. Light and air spaces above decks.
13. Air casings, for insulation, if within machinery spaces.
14. Auxiliary machinery spaces in main machinery compartments.
15. Coal spaces.
    (*a*) Actual capacity of bunkers and trunks thereto.
    (*b*) Seventy-five per cent machinery space for screw steamers or 50 per cent for paddle steamers.
16. Fuel oil, in other than double bottom compartments, which are exempt from measurement in gross.

The following spaces are not to form part of machinery deduction when bulkheaded off from machinery space proper or forming a separate space therefrom:

1. Dynamo rooms.
2. Distiller spaces.
3. Engineers' workshop.
4. Storerooms in machinery spaces.
5. Donkey engine and boiler when not in or immediately adjacent to machinery spaces.
6. Staterooms in machinery spaces.

REFERENCES

For reference in connection with the question of tonnage, see—

(*a*) United States Statutes at Large, Revised Statutes United States, Nos. 4150 to 4154, pages 803 to 806.
(*b*) Supplement, Revised Statutes United States, volume 1, act of August 5, 1882, page 378, chapter 398, act of June 19, 1886, page 494, chapter 421, section 5.
(*c*) Supplement, Revised Statutes United States, volume 2, act of March 2, 1895, page 407, chapter 173.
(*d*) United States Statutes at Large, volume 35, part 1, Public Laws, act of February 6, 1909, page 613, chapter 82, section 1.
(*e*) Customs Regulations, 1908. (Treasury Department.)

(*f*) Navigation Laws, United States, 1911 (corrected). (Department of Commerce and Labor.)
(*g*) Instructions relating to the measurement of ships, 1913. (British Board of Trade.)
(*h*) Regulations for the Navigation of the Suez Maritime Canal, 1924.
(*i*) Translation (Naval Intelligence). Instructions for the measurement of ships. (German.)
(*j*) Responses aux Questions de Tonnage concernant les Navires de Guerre. (C. & R. No. 6215A21 to 25.)
(*k*) Letter, Bureau of Navigation, Department of Commerce and Labor. (C. & R. No. 6563A7 and 8.)
(*l*) Letter No. 6215A19 and 20 in re rulings of the Suez Co.
(*m*) Report on certificate, U. S. S. *New York* (6215A8).
(*n*) Copy of Suez certificate for the U. S. S. *Abarenda* (25945E3).

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Part V.—PANAMA CANAL MEASUREMENT

1. Customs officers authorized to measure vessels at ports of the United States are authorized by Article XVI of the following proclamation of the President of the United States of November 21, 1913, "Rules for the measurement of vessels for the Panama Canal," to measure vessels according to Panama Canal rules for measurement and to issue Panama Canal tonnage certificates.

2. Customs officers may obtain a supply of Panama Canal tonnage certificates from the "Chief of Office, the Panama Canal, Washington, D. C."

3. Questions of interpretation under Panama Canal measurement rules will be submitted in writing directly to the governor of the Panama Canal, Balboa Heights, Canal Zone. Decisions on such questions will be published and distributed to collectors of customs.

THE PANAMA CANAL

EXECUTIVE OFFICE

CULEBRA, CANAL ZONE, *April 1, 1914.*

Circular No. 601–2.

PROCLAMATION

RULES FOR THE MEASUREMENT OF VESSELS FOR THE PANAMA CANAL

The proclamation of the President quoted below is published for the information of all concerned.

GEO. W. GOETHALS, *Governor.*

BY THE PRESIDENT OF THE UNITED STATES OF AMERICA

A PROCLAMATION

I, Woodrow Wilson, President of the United States of America, by virtue of the power and authority vested in me by the act of Congress approved August twenty-fourth, nineteen hundred and twelve, to provide for the opening, maintenance, protection, and operation of the Panama Canal and the sanitation and government of the Canal Zone, do hereby prescribe and proclaim the "Rules for the measurement of vessels for the Panama Canal," which are annexed hereto and made a part of this proclamation.

In witness whereof I have hereunto set my hand and caused the seal of the United States to be affixed.

Done at the city of Washington this twenty-first day of November, in the year of our Lord one thousand nine hundred and thirteen

and of the independence of the United States the one hundred and thirty-eighth.

[SEAL.] WOODROW WILSON.

By the President:

W. J. BRYAN,

Secretary of State.

VESSELS FOR THE PANAMA CANAL

1. *Article I.*—All vessels, American and foreign, except warships, including vessels of commerce and Army and Navy transports, colliers, supply ships, and hospital ships, applying for passage through the Panama Canal shall present a duly authenticated certificate stating the vessel's gross and net tonnage as determined by these rules. Vessels of commerce, Army and Navy transports, colliers, supply ships, and hospital ships without such certificate shall, before passing through the canal or before being allowed to clear therefrom, be measured, and shall have their gross and net tonnage determined in accordance with these rules.

2. All warships, American and foreign, other than transports, colliers, supply and hospital ships, shall present duly authenticated displacement scale and curves stating accurately the tonnage of displacement at each possible mean draft.

3. It is to be understood that "supply ships" shall include Army and Navy ammunition ships, refrigerator ships, distilling ships, repair ships, submarine tenders, and destroyer tenders, as well as Army and Navy vessels used to transport general Army and Navy supplies, and that "colliers" shall include Army and Navy vessels used to transport coal or fuel oil.

GROSS TONNAGE

4. *Article II.*—Gross tonnage as determined by these rules shall express the total capacity of vessels; i. e., the exact cubical contents of all spaces below the upper deck and of all permanently covered and closed-in spaces on or above that deck, excepting such spaces as may be hereinafter permitted as exemptions from measurement. Gross tonnage shall include not only all permanently covered and closed-in spaces which are or may be used for stowing cargo and stores or for providing shelter and other comfort for passengers or crew, but also such spaces as are used or are intended to be used in navigating and serving the vessel.

5. Only such spaces as are specifically mentioned in Article IV, below, shall be exempted from measurement. All other spaces shall be considered as closed in and shall be included in gross tonnage.

6. *Article III.*—By permanently covered and closed-in spaces on or above the upper deck are to be understood all those which are separated off by decks or coverings or fixed partitions, and which, therefore, represent an increase of capacity that is or may be used for the stowage of cargo or for the berthing and accommodation of the passengers, the officers, or the crew. No break in a deck nor any opening or openings in a deck or the covering of a space or in the partitions or walls of a space nor the absence of a partition shall prevent a space from being measured and comprised in gross

tonnage if the opening or openings in the deck, partition, or side wall can be closed in, or if the absent partition can be put in place, after admeasurement and the spaces thus closed in be thereby better fitted for the transport of goods or passengers.

7. In the case of a vessel having a "trunk" or "turret" the deck forming the covering of the trunk or turret shall be considered the upper deck and all spaces below that deck within the trunk or turret shall be considered as covered and closed in. The space within the turret or trunk shall be measured as are other between-deck spaces.

8. Spaces considered as "Permanently closed in" and spaces permitted to be exempted from measurement shall be determined solely by the provisions contained in these rules, and not by any definitions or provisions contained in the measurement rules or regulations of any country.

9. *Article IV.*—The following spaces shall be exempted from measurement and shall not be included in the gross tonnage, and no other spaces shall be exempted:

10. SECTION 1. Spaces on or above the upper deck not permanently covered or closed in, or which may not be readily covered or closed in. In the application of this rule it will be understood that—

(*a*) Spaces under decks or coverings having no other connection with the body of the ship than the stanchions necessary for their support are not spaces separated off, but are spaces permanently exposed to the weather and the sea and are not to be included in the gross tonnage.

(*b*) A space within a poop, forecastle, bridge house, or other "Permanently covered and closed in" superstructure or erection may be considered as not permanently covered or closed in and may consequently be excluded from tonnage, if the space is opposite an end opening which is without a coaming and has no headplates or planks and is not provided with means of closing, and which opening has a breadth equal to or greater than half the breadth of the deck at the line of the opening, and if the space opposite the opening can not be used to shelter other merchandise than cargo or stores that do not require protection from the sea. If the opening is fitted with a coaming, the space within it is to be included in the gross tonnage. This provision shall be so applied as to exempt from measurement only the space between the actual end opening and a line drawn parallel to the line or face of the opening at a distance from the opening equal to one-half the width of the deck at the line of the opening, provided that any closed-in space between the open face and the line drawn parallel to it shall be measured. The remainder of the space within a poop, forecastle, bridge house, or other superstructure or erection shall be considered as available for the accommodation of cargo or stores, of passengers or of the ship's personnel, and shall be measured and included in the gross tonnage. (See figs. 42, 43, and 44.) Should the open space within a poop, forecastle, bridge house, superstructure, or erection between the end opening and a parallel line distant from the openings by half the breadth of the deck become, because of any arrangement, of less width than half the breadth of the deck, then only the space between the line of the end opening and a parallel line drawn through the point where the athwartship width of the open space within the poop, forecastle, bridge house, superstructure, or erection

becomes equal to, or less than, half the breadth of the deck shall be exempted from measurement. (See figs. 45, 46, 47, and 48.) The remainder of the space within the poop, forecastle, bridge house, superstructure, or erection is to be included in the gross tonnage.

When two erections extending from side to side of the ship are separated by an interval the fore-and-aft length of which is less than the least half breadth of the deck in way of such interval, then whatever be the breadth of the permanent end openings of the erections, the entire erections, less the interval separating them, shall be measured and included in the gross tonnage. (See fig. 49.)

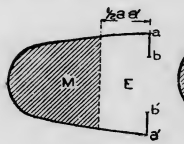

FIG. 42.—Poop

$b' > \frac{1}{2}\ aa'$; *E*, space exempted; *M*, space measured

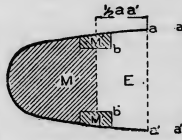

FIG. 43.—Poop

$bb' > \frac{1}{2}\ aa'$; *E*, space exempted; *M'*, closed-in houses, measured; *M*, space measured

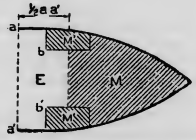

FIG. 44.—Forecastle

$bb' > \frac{1}{2}\ aa'$; *E*, space exempted; *M'*, closed-in houses, measured; *M*, space measured

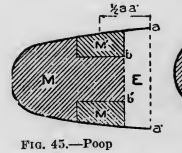

FIG. 45.—Poop

$bb' < \frac{1}{2}\ aa'$; *E*, space exempted; *M'*, closed-in houses, measured; *M*, space measured

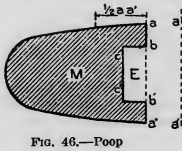

FIG. 46.—Poop

$bb' > \frac{1}{2}\ aa'$; $cc' < \frac{1}{2}\ aa'$; *E*, space exempted; *M*, space measured

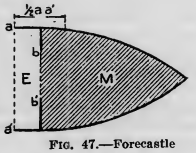

FIG. 47.—Forecastle

$bb' < \frac{1}{2}\ aa'$; *E*, space exempted; *M*, space measured

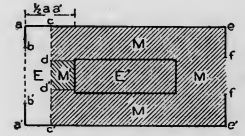

FIG. 48.—Bridge

$bb' > \frac{1}{2}\ aa'$; $cd < \frac{1}{2}\ aa'$; $c'd' < \frac{1}{2}\ aa'$; $ff < \frac{1}{2}\ cc'$; *E*, space exempted; *E'*, light and air and funnel space in lowest tier of erection, measured under Art. IV, sec. 3; *M*, space measured; *M'*, closed house, measured

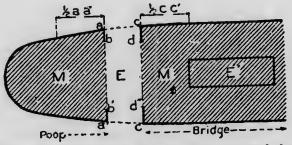

FIG. 49.—Poop and bridge with interval less than one-half the least half breadth of the deck in the way of interval

$ao < \frac{1}{2}\ aa'$; $a'c' < \frac{1}{2}\ aa'$; $bb' > \frac{1}{2}\ aa'$; $dd' > \frac{1}{2}\ cc'$; *M*, spaces measured; *E*, space exempted; *E'*, light and air and funnel space in lowest tier of erections, measured under Art. IV, sec. 3

(*c*) In a poop, forecastle, side-to-side bridge house, or other "permanently covered and closed-in" superstructure or side-to-side erection, the space directly in way of opposite openings, the height of which is at least 3 feet, in the side walls of the ship not provided

with means of closing and corresponding to each other in the opposite walls of the ship shall be exempted. (See figs. 50 and 51.)

[NOTE.—Passages running fore and aft abreast the engine-room casing and open at both ends shall not be exempted. The deck erection including same shall be considered a side-to-side erection provided its outboard sides are flush with the hull of the vessel.]

11. SEC. 2. Spaces in way of opposite side openings at least 3 feet in height not provided with means of closing shall be exempted. In the case of a continuous deck with one or more deck openings

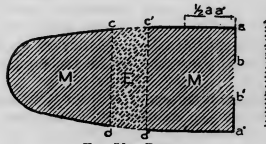

FIG. 50.—Poop

cc' and *dd'*, side openings under deck covering; *E*, space exempted; $bb' < \frac{1}{2}\ aa'$; *M*, spaces measured

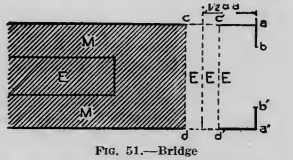

FIG. 51.—Bridge

$bb' > \frac{1}{2}\ aa'$; *cc'* and *dd'*, side openings; *E*, spaces exempted; *M*, space measured; *E'*, light and air and funnel space in lowest tier of erection, measured under Art. IV, sec. 3

(usually designated as tonnage openings) that may be so closed as to permit cargo or stores to be carried in the space under the deck, or under portions thereof, only the spaces under such a deck that are exactly in way of opposite openings at least 3 feet in height in the side walls of the ship not provided with means of closing and corresponding to each other in the opposite walls of the ship shall be exempted; and the remaining spaces under such a deck shall be measured and included in gross tonnage. In case the openings in

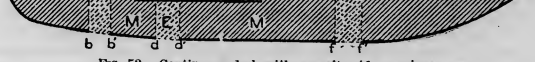

FIG. 52.—Continuous deck with opposite side openings

aa', *bb'*, *cc'*, *dd'*, *ee'*, *ff'*, side openings; *E*, spaces exempted opposite side openings below continuous deck; *M*, spaces measured; *E'*, light and air and funnel space, measured under Art. IV, sec. 3

the side walls of the ship are provided with means of closing, no portion of the space under such a deck shall be exempted. (Fig. 52.)

12. SEC. 3. The spaces framed in round the funnels and the spaces required for the admission of light and air into the engine rooms shall be exempted from measurement to the extent that such spaces are above the deck or covering of the first or lowest tier of side-to-side erections, if any, on the upper deck. A deck with one or more deck openings (usually designated as tonnage openings) that may be so closed as to permit cargo or stores to be carried in the space under the deck or portions thereof is to be considered as the upper deck,

provided that no space beneath it abreast side openings is exempted under the provisions of section 2. There shall, however, be measured and included within gross tonnage the spaces situated within closed in side-to-side erections on the upper deck, spaces framed in round the funnels and those required for the admission of light and air to the extent that such light and air and funnel spaces are below the deck or covering of the first or lowest tier of such side-to-side erections on the upper deck. There shall be exempted from the measurement of any superstructure or erection situated above the first or lowest tier of side-to-side erections on the upper deck such portion or portions thereof as are occupied by the spaces framed in round the funnels or by the spaces required for the admission of light and air into the engine rooms. Such exempted spaces must not be used for any other than their designated purpose and must be reasonable in extent.

13. SEC. 4. Space or spaces between the inner and outer plating of the double bottom of a vessel that are so inclosed and that have such openings as to make them usable only for water ballast shall be exempted from measurement, but such spaces within the double bottom as are or may be used for carrying cargo, stores, feed water, coal, or other fuel shall be measured and included in the gross tonnage.

[NOTE.—In determining the tonnage of double-bottom tanks used for other than water ballast the liquid-capacity weight times proper conversion factor in tons of 100 cubic feet will be accepted as authentic.]

14. SEC. 5. The cubical contents of hatchways shall be obtained by multiplying the length and breadth together and the product by the mean depth taken from the top of beam to the underside of the hatch. From the aggregate tonnage of the hatchways there shall be deducted one-half of 1 per cent of the vessel's gross tonnage, exclusive of hatchways, and only the remainder shall be added to the gross tonnage of the ship, exclusive of the tonnage of the hatchways.

15. SEC. 6. Companionways and companion houses shall be exempted when used solely as companionways or companion houses. When used as smoking rooms or for any other purposes than companionways or companion houses, the parts so used shall be measured and included in gross tonnage.

16. SEC. 7. Domes and skylights shall be exempt from measurement. When there is an opening in the floor of a superstructure immediately below a skylight, the exemption shall include the space between the skylight and the opening in the floor of the superstructure immediately under the skylight. The remainder of the superstructure shall be included in the measurement. The space, in addition to the skylight, that may be exempted by this rule is that indicated by *A*, *B*, *C*, *D* in Figure 53.

17. *Article V.*—Should a vessel at any time stow cargo of any kind, bunker coal, or other fuel, or stores of any description in any portion whatever of any exempted space, except spaces exempted under Article IV, section 1, paragraph (*b*) and spaces on open decks not permanently covered, or upon decks as defined in Article IV, section 1, paragraph (*a*) of these rules, the whole of that space shall be measured and added to the gross tonnage, and the space shall not thereafter be exempted from measurement.

18. *Article VI.*—Spaces for the use or possible use of passengers shall not be exempted from measurement, except as stated in Article IV, section 1, paragraph (*a*).

19. In case of Army and Navy transports, colliers, supply ships, and hospital ships as defined in Article I, the term "Passengers" shall include all officers, enlisted men, and other persons who are not assigned to duty and who are not duly inscribed on the ship's rolls.

20. *Article VII.*—If any ship carries stores, timber, cattle, or other cargo in any space upon an open deck not permanently covered or in spaces exempted under Article IV, section 1, paragraphs (*a*) and (*b*) of these rules, all tolls and other charges payable on the vessel's net tonnage shall be payable upon the vessel's net tonnage (as defined below in Articles X and XII) increased by the tonnage of the space occupied (at the time at which the tolls or other charges become payable) by the goods carried upon deck and not permanently covered or closed in. The deck space occupied by the goods thus carried shall be determined at the time of the application of the vessel for passage through the canal and shall be deemed to be the space limited by the area occupied by the goods and by straight lines inclosing a rectangular space sufficient to include the goods.

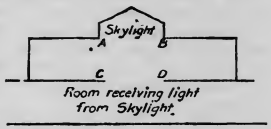

FIG. 53.—Open space under skylight

21. The tonnage of the space occupied by the goods shall be ascertained in the manner prescribed below by Article IX, Rule I, for the measurement of poops or other closed-in spaces.

22. Nothing in this article shall in any manner affect the provisions of Articles II, III, and IV.

23. *Article VIII.*—The cubical contents of the spaces included by these rules in gross tonnage may, in any country where the Moorsom system of measurement has been adopted, be ascertained under that system as applied in measuring vessels for national registry, provided that system is substantially similar to the Moorsom system of measurement as set forth in Article IX of these rules.

24. *Article IX.*—In countries that have not adopted the Moorsom system of measuring spaces within vessels, the cubical contents of any of the spaces included in gross tonnage shall be ascertained according to the Moorsom system as set forth in the following rules: Rule I for the measurement of empty vessels; Rule II for laden vessels; Rule III for open vessels.

RULE I.—FOR MEASURING THE GROSS TONNAGE OF EMPTY VESSELS

25. SECTION 1. The length for the admeasurement of ships having one or more decks is taken on the tonnage, which is (*a*) the upper deck of vessels having one or two decks, (*b*) the second deck from below for vessels having more than two decks.

26. Measure the length of the ship in a straight line along the upper side of the tonnage deck from the inside of the inner plank (average thickness) at the side of the stem to the inside of the midship stern timber or plank there, as the case may be (average thick-

ness), deducting from this length what is due to the rake of the bow in the thickness of the deck and what is due to the rake of the stern timber in the thickness of the deck, and also what is due to the rake of the stern timber in one-third of the round of the beam; divide the length so taken into the number of equal parts required by the following table, according to the class in such table to which the ship belongs:

(*a*) Class 1. Ships of which the tonnage deck is, according to the above measurement, 50 feet long, or under, into four equal parts.

(*b*) Class 2. Ships of which the tonnage deck is, according to the above measurement, above 50 feet long and not exceeding 120 feet, into six equal parts.

(*c*) Class 3. Ships of which the tonnage deck is, according to the above measurement, above 120 feet long and not exceeding 180 feet, into eight equal parts.

(*d*) Class 4. Ships of which the tonnage deck is, according to the above measurement, above 180 feet long and not exceeding 225 feet, into 10 equal parts.

(*e*) Class 5. Ships of which the tonnage deck is, according to the above measurement, above 225 feet long, into 12 equal parts.[1]

27. In the case of a break or breaks in a double bottom for water ballast the length of the vessel is to be taken in parts according to the number of breaks, and each part divided into a number of equal parts according to the class in the above table to which such length belongs.

28. SEC. 2. Then, the hold being first sufficiently cleared to admit of the required depths and breadths being properly taken, find the transverse area of the ship at each point of division of the length or each point of division of the parts of the length, as the case may require, as follows: Measure the depth at each point of division from a point at a distance of one-third of the round of the beam below the tonnage deck, or, in case of a break, below a line stretched in continuation thereof, to the upper side of the floor timber (upper side of the inner plating of the double bottom) at the inside of the limber strake, after deducting the average thickness of the ceiling which is between the bilge planks and the limber strake, subject, however, to the provisions of these rules, Article IV, section 4, regarding the measurement or exemption of double-bottom spaces. In the case of a ship constructed with a double bottom for water ballast if the space between the inner and outer plating thereof is not available for the carriage of cargo, stores, feed water, coal, or other fuel, then the depth shall be taken to be the upper side of the inner plating of the double bottom, and that upper side shall, for the purposes of measurement, be deemed to represent the floor timber of the vessel. This rule for measuring the depth of the hold applies to double-bottom ships having top of double bottom *not* horizontal.

29. If the depth of the midship division of the length does not exceed 16 feet, divide each depth into five equal parts; then measure the inside horizontal breadth at each of the four points of division,

[1] A greater number of divisions is permissible provided there be an even number of divisions.

and also at the upper point of the depth, extending each measurement to the average thickness in that part of the ceiling which is between the points of measurement. Number these breadths from above (i. e., numbering the upper breadth 1, and so on down to the fifth breadth), multiply the second and fourth by 4 and the third by 2; add these products together, and to the sum add the first breadth and the fifth. Multiply the quantity thus obtained by one-third of the common interval between the breadths, and the product shall be deemed the transverse area of the upper part of the section; then find the area between the fifth and lower point of the depth by dividing the depth between such points into four equal parts and measure the horizontal breadths at the three points of division and also at the upper and lower points and proceed as before, and the sum of two parts shall be deemed to be the transverse area; but if the midship depth exceed 16 feet divide each depth into seven equal parts, instead of five, and measure as before directed the horizontal breadths at the six points of division, and also at the upper point of the depth; number them from above, as before; multiply the second, fourth, and sixth by 4 and the third and fifth by 2; add these products together and to the sum add the first breadth and the seventh. Multiply the quantity thus obtained by one-third of the common interval between the breadths, and the products shall be deemed the transverse area of the upper part of the section; then find the lower part of the area as before directed and add the two parts together and the sum shall be deemed to be the transverse area.

30. This section applies to vessels with double bottoms the tops of which have a rise from the middle line to each side. In vessels in which the top of the double bottom is horizontal, or in which there is no double bottom, the depths are to be divided by 4 or 6 (instead of 5 or 7), according as their midship depths do not or do exceed 16 feet, respectively. In such cases no subdivision of the lower part is to be made.

[NOTE.—In the case of ships built on the Isherwood system the depths are to be taken to the upper edge of the longitudinal frames, where no double bottom exists. In vessels built of concrete the depths and breadths shall be taken to the inner edge of the main frames. It is to be noted that sec. 2, par. 30, provides that in vessels without double bottoms no subdivision of the lower part of the transverse area is to be made. On ships built with transverse frames without double bottom the depths are to be taken to the top of the transverse frames, and no subdivision of the lower section is necessary.]

31. SEC. 3. Number the transverse sections or areas, respectively, 1, 2, 3, etc., No. 1 being at the extreme limit of the length at the bow, or of each part of the length, and the last number at the extreme limit of the length at the stern or the extreme limit at the after end of each part of the length; then whether the length be divided according to the table into 4 or 12 parts, as in classes 1 and 5, or any intermediate number, as in classes 2, 3, and 4, multiply the second and every even-numbered area by 4 and the third and every odd-numbered area (except the first and last) by 2; add these products together and to the sum add the first and last, if they yield anything; multiply the quantity thus obtained by one-third of the

common interval between the areas and the product will be the cubical contents of the space, or cubical contents of each part if the ship is measured in parts under the tonnage deck. The tonnage of this volume is obtained by dividing it by 100 if the measurements are taken in English feet and by 2.83 if the measurements are taken in meters. The multiplier 0.353 may be used instead of the divisor 2.83.

32. SEC. 4. If the ship has a third deck, the tonnage of the space between it and the tonnage deck shall be ascertained, as follows: Measure in feet the inside length of the space at the middle of its height from the plank at the side of the stem to the lining on the timbers at the stern and divide the length into the same number of equal parts into which the length of the tonnage deck is divided, as above directed; measure (also at the middle of its height) the inside breadth of the space at each of the points of division; also the breadth at the stem and the breadth at the stern; number them successively 1, 2, 3, etc., commencing at the stem; multiply the second and all the other even-numbered breadths by 4 and the third and all the other odd-numbered breadths (except the first and last) by 2; to the sum of these products add the first and last breadths, multiply the whole sum by one-third of the common interval between the breadths, and the result will give, in superficial feet, the mean horizontal area of the space; measure the mean height of the space and multiply by it the mean horizontal area and the product will be the cubical contents of the space; divide this product by 100 (or by 2.83 if the measurements are taken in meters) and the quotient shall be deemed to be the tonnage of the space and shall be added to the tonnage of the ship ascertained as aforesaid; and if the ship has more than three decks, the tonnage of each space between decks above the tonnage deck shall be severally ascertained in the manner above described and shall be added to the tonnage of the ship ascertained as aforesaid.

33. SEC. 5. If there be a break, a poop, or any other permanently covered or closed-in space on or above the upper deck (as defined above in Article III), the tonnage of such space shall be ascertained as follows: Measure the internal mean length of the space in feet and divide it into two equal parts; measure at the middle of its height three inside breadths, namely, one at each end and the other at the middle of the length; then to the sum of the end breadths add four times the middle breadth and multiply the whole sum by one-third of the common interval between the breadths, the product will give the mean horizontal area of the space; then measure the mean height and multiply by it the mean horizontal area; divide the product by 100 (or by 2.83 if the measurements are taken in meters) and the quotient shall be deemed to be the tonnage of the space.

34. SEC. 6. In measuring the length, breadth, and height of the general volume of the ship or that of the other spaces, reduce to the mean thickness the parts of the ceiling which exceed the mean thickness. When the ceiling is absent, or when it is not permanently fixed, the length and breadth shall be reckoned from the main frames of the ship, not from the web or belt frames. The same principle is to hold in the case of deck erections; that is, the breadth is to be

reckoned from the main framing or stiffeners of the same when ceiling is not fitted. When the main framing of the ship is curved or carried upward and inboard so as to permit the building of topside tanks or compartments outboard of the main framing, the breadth of the ship shall be reckoned from the outboard framing of such outboard tanks, thus including these tanks in the measurement.

RULE II.—FOR MEASURING THE GROSS TONNAGE OF LADEN SHIPS

35. SEC. 7. When ships have cargo on board, or when for any other reason their tonnage can not be ascertained by means of Rule I, proceed in the following manner:

36. Measure the length of the uppermost full-length deck from the outside of the outer plank at the stem to the aft side of the sternpost, deducting therefrom the distance between the aft side of the sternpost and the rabbet of the sternpost at the point where the counterplank crosses it. Measure also the greatest breadth of the ship to the outside of the outer planking or wales at the middle perpendicular. Then, having first marked on the outside of the ship on both sides thereof the height of the uppermost full-length deck at the ship's sides, girt the ship at the middle perpendicular in a direction perpendicular to the keel from the height so marked on the outside of the ship, on the one side, to the height so marked, on the other side, by passing a chain under the keel; to half the girt thus taken add half the main breadth; square the sum, multiply the result by the length of the ship taken as aforesaid, then multiply this product by the factor 0.17 in the case of ships built of wood and by the factor 0.18 in the case of ships built of iron or steel. The product will give approximately the cubical contents of the ship, and the tonnage can be ascertained by dividing by 100 or by 2.83, according as the measurements are taken in English feet or in meters.

37. SEC. 8. If there be a break, a poop, or other permanently covered and closed-in spaces (as defined above in Article III) on or above the uppermost full-length deck, the tonnage of such spaces shall be ascertained by multiplying together the mean inside length, breadth, and depth of such spaces and dividing the product by 100 or 2.83, according as the measurements are taken in English feet or meters, and the quotient so obtained shall be deemed to be the tonnage of the spaces and shall be added to the other tonnage in order to determine the gross tonnage or total capacity of the ship.

RULE III.—FOR MEASUREMENT OF OPEN VESSELS

38. SEC. 9. In ascertaining the tonnage of open ships the upper edge of the upper strake of the shell plating is to form the boundary line of measurement, and the depths shall be taken from an athwartship line extended from upper edge to upper edge of the said strake at each division of the length.

DEDUCTIONS FROM THE GROSS TONNAGE TO ASCERTAIN THE NET TONNAGE

(A) DEDUCTIONS FOR VESSELS NOT PROPELLED BY ENGINES

39. *Article X.*—The following spaces (enumerated below in sections 1 to 10 of this article) shall be deducted from the gross tonnage in order to ascertain the net tonnage of vessels *not propelled by engines*, and no other spaces shall be deducted. Unless otherwise expressly stipulated, these spaces shall be deducted whether located above or below the upper deck.

40. The volume or cubical contents of deducted spaces shall be ascertained in the manner specified in Article VIII or Article IX of these rules. The remainder, resulting from deducting from the total space included in gross tonnage the sum of the cubical contents of the spaces whose deduction from gross tonnage is permitted by these rules, shall be the net or register tonnage of vessels not propelled by engines and unrigged craft upon which tolls and other charges based upon tonnage shall be paid by vessels of commerce, Army and Navy transports, colliers, supply ships, and hospital ships (as defined in Article I) for passage through the Panama Canal. One hundred cubic feet, or 2.83 cubic meters, shall constitute 1 gross or net ton.

41. Spaces for the use or possible use of passengers (as defined in Article VI) shall not be deducted from the gross tonnage, except in so far as their deduction may be specifically provided for in the following sections (1 to 10) of this article of these rules.

42. Spaces available for the stowage of stores (other than boatswain's stores) or cargo shall not be deducted from gross tonnage. In the case of Army or Navy transports, colliers, supply ships, and hospital ships, as defined in Article I, the term "Stores (other than boatswain's stores) or cargo" shall include, in addition to goods or cargo ordinarily carried as freight on vessels of commerce, the following articles:

(*a*) On transports, food, stores, luggage, accouterments, and equipment for passengers.

(*b*) On colliers, coal, coaling gear, and fuel oil not for the use of the colliers.

(*c*) On supply ships, stores, supplies of all kinds, distilling machinery and distilled water (other than feed water stored in double-bottom compartments), machines, tools, and material for repair work, mines and mining material, torpedoes, arms, and ammunition.

(*d*) On hospital ships, food, stores for passengers, medical stores, and hospital equipment.

(*e*) Guns mounted on transports and supply ships for defense of the ships and ammunition required for use in such guns shall not be classed as cargo.

43. SEC. 1. The tonnage of the spaces or compartments occupied by, or appropriated to the use of, the officers and crew of the vessel shall be deducted. The term "Officers and crew" shall include the personnel inscribed on the ship's rolls, i. e., the ship's officers, engineers, doctors, apothecary, sick attendants, sailors, apprentices, firemen, mechanics, and wireless operators, but shall not include clerks, pursers, stewards, and other members of the personnel provided by the ship for the care of the passengers. The spaces or compartments occupied by the officers and crew shall include their berthing accomodations, spaces provided for medical attention, mess rooms, ward and dressing rooms, bath and wash rooms, water-closets, latrines, lavatories, or privies for their exclusive use, and passageways exclusively serving these spaces.

[NOTE.—Cabins of clerks or pursers on nonpassenger-carrying vessels, office of master or chief engineer, medicine locker, cabin of supercargo when signed on articles shall be allowed as deductions. Spare rooms, pilots rooms, and linen locker are not allowed as deductions.]

44. SEC. 2. On hospital ships the spaces or compartments occupied by doctors, apothecary, and sick attendants duly inscribed on the ship's rolls shall form part of the deduction under section 1 of this article. Spaces provided for the medical attention of the officers and crew of a hospital ship shall likewise be deducted, but spaces fitted for the transportation or for the medical attention of other persons than those duly listed in the ship's rolls shall not be deducted.

45. SEC. 3. The space occupied by the master's cabin shall be deducted.

46. SEC. 4. Cook houses, galleys, bakeries, laundries, and rooms for ice machines, when used exclusively to serve the officers and crew, and the condenser space, and distilling rooms, when used exclusively for condensing and distilling the water for the officers and crew, shall be deducted.

47. SEC. 5. Spaces used for the anchor gear, steering gear, and capstan; the wheel house, the dynamo rooms; the chart room used exclusively for keeping charts, signals, and other instruments of navigation; lookout houses; spaces for keeping electric searchlights, and wireless-telegraph appliances; and other spaces actually used in the navigation of the ship shall be deducted. Such spaces upon vessels of commerce as may be devoted to the mounting of guns and to the stowage of ammunition for the guns thus mounted shall be deducted. The deduction of all spaces, other than those devoted to the mounting of guns, enumerated in this section must be reasonable in extent and be subject to the limitations stipulated below in Article XI.

[NOTE.—Chain locker shall be allowed as part of anchor gear. Pump room used to pump fuel oil, feed water, ballast, or to free ship of water, also carpenter shop and fumigating machine shall be allowed as deductions. Note that paint room and lamp room are not given separate deduction but are deducted under boatswain's stores.]

48. SEC. 6. In case of a ship propelled wholly by sails, any space, not exceeding 2½ per cent of the gross tonnage, used exclusively for storage of sails shall be deducted.

49. SEC. 7. Spaces used exclusively for boatswain's stores shall be deducted. The deduction is not, however, to exceed 1 per cent of the

gross tonnage in ships of 1,000 tons gross and upward, nor more than 75 tons in any ship however large. In vessels from 500 to 1,000 tons gross the limit is fixed at 10 tons and in vessels from 150 to 500 tons at not more than 2 per cent of the gross tonnage. In vessels under 150 tons at not more than 3 tons.

[NOTE.—Paint room and lamp room are to be included in deductions for boatswain's stores.]

50. SEC. 8. The space occupied by donkey engine and boiler shall be deducted if the donkey engine and boiler are connected with the main pumps of the ship, or if they are located in a permanently covered or closed-in structure on or above the upper deck.

51. SEC. 9. Passages and passageways shall be deducted if they serve deducted spaces exclusively for the officers and crew.

52. SEC. 10. Water ballast spaces, other than spaces in the vessel's double bottom, shall be deducted if they are adapted only for water ballast, have only ordinary manholes for access, and are not available for the carriage of cargo, stores, or fuel. If used to carry oil or other fuel, these spaces shall be regarded as part of the vessel's fuel space and shall not be subject to separate deduction.

[NOTE.—Tonnage of tanks may be obtained by using liquid capacity × conversion factor with one-sixth off for frames in case of peak tanks and one-twelfth off in case of wings or deep tanks when they can not be readily measured.]

53. *Article XI.*—Each of the spaces enumerated in Article X, sections 1 to 10, unless otherwise specifically stated, shall be subject to such conditions and requirements as to marking or designation and use or purpose as are contained in the navigation or registry laws of the several countries, but no space, other than fuel spaces deducted under Article XIII of these rules, shall be deducted unless the use to which it is to be exclusively devoted has been appropriately designated by official marking. In no case, however, shall an arbitrary maximum limit be fixed to the aggregate deduction made under Article X.

(B) DEDUCTIONS FOR VESSELS PROPELLED BY ENGINES

54. *Article XII.*—The net or register tonnage upon which tolls and other charges based upon tonnage shall be paid by *vessels* of commerce, Army and Navy transports, colliers, supply ships, and hospital ships, as defined in Article I, *propelled by engines*, for passage through the Panama Canal, shall be the tonnage remaining after the following deductions have been made from the gross tonnage. One hundred cubic feet, or 2.83 cubic meters, shall constitute 1 gross or net ton. Vessels propelled partly by sails and partly by engines shall be classed as "Vessels propelled by engines."

55. SECTION 1. The spaces specified above in Article X shall be deducted from the space included in gross tonnage to ascertain net tonnage in the case of vessels propelled by engines as in the case of vessels not propelled by engines.

56. SEC. 2. The space occupied by the engines, boilers, coal bunkers, fuel-oil tanks, double-bottom fuel and feed-water compartments, shaft trunks of vessels with screw propellers, spaces within a closed-in side-to-side erection that are framed in around the funnels, or that are required for the introduction of light and air to the engine room to the extent that the framed-in spaces around the funnels and the light and air casings are located below the deck or covering of the first or lowest tier of such erections, if any, on the upper deck, as defined in Article IV, section 3, and are contained in closed-in side-to-side erections, spaces necessary for the proper working of the engines, and spaces occupied by the donkey engine and boiler when situated within the boundary of the engine room or within the light and air casings above the engine room and when used in connection with the main machinery for propelling the vessel. When the shafts of screw propellers pass through open spaces not inclosed within tunnels, the spaces allowed in lieu of the tunnels must be of reasonable dimensions suitable for the vessel in question. When any portion of the engine or boiler rooms is occupied by a tank for fresh water, the space thus taken up shall not be deducted.

57. Donkey engine and boiler spaces when deducted according to Article XIV below shall not be made a separate deduction.

58. The portion of the framed-in spaces around the funnels and of the light and air casings that extend above the deck or covering of the first or lowest tier of side-to-side erections, if any, on the upper deck, as defined in Article IV, section 3, and surrounding the said space or spaces are exempted from measurement and form no part of the space deducted under this section.

59. SEC. 3. The deductions made for propelling power, including all those provided for in section 2 of this article, shall in no case exceed 50 per cent of the gross tonnage, except in case of tugs employed exclusively as tugs. In other respects the spaces enumerated in section 2 shall, except as otherwise specifically stated, be subject to the requirements as to designation or marking and use or purpose contained in the navigation or registry laws of the several countries.

60. SEC. 4. The deductions made for propelling power provided for in section 2 of this article shall be made according to the provisions of Article XIII or of Article XIV, *as the owner of the vessel may elect.*

61. SEC. 5. Double-bottom compartments that are set aside to be used exclusively for the stowage of feed water for the ship's boilers shall be deducted.

62. *Article XIII.*—In ships that do not have fixed bunkers, but transverse bunkers with movable partitions, with or without lateral bunkers, and in ships with fuel tanks or double-bottom fuel compartments which may be used to stow cargo or stores, measure the space occupied by the engine rooms and add to it for vessels with screw propellers 75 per cent and for vessels with paddle wheels 50 per cent of such space.

63. By the space occupied by the engine rooms is to be understood that occupied by the engine room itself and the boiler room, together with the spaces strictly required for the working of the engines and boilers, with the addition of the spaces taken up by shaft trunks (in vessels with screw propellers), the spaces which inclose the fun-

nels and the casings necessary for the admission of light and air into the engine room to the extent that such spaces are located below the upper deck or below a deck with openings (usually designated as tonnage openings) which may be so closed as to permit the carriage of cargo or stores under the deck or a portion thereof, and donkey engine and boiler spaces when the donkey engine and boiler are situated within the boundary of the main engine room or of the light and air casing above it, and when they are used in connection with the main machinery for propelling the vessel. When the shafts of screw propellers pass through open spaces not inclosed within tunnels the spaces allowed in lieu of tunnels must be of reasonable dimensions suitable for the vessel in question. When a portion of the space within the boundary of the engine or boiler rooms is occupied by a tank or tanks for fuel oil or fresh water, the space considered to be within the engine room shall be reduced by the space taken up by the tank or tanks for fuel oil or fresh water.

[NOTE.—Note that fuel-oil settling tanks are not to be included in the propelling-power space, no matter where situated. Storerooms, dynamos, ice machine, etc., situated in the confines of the engine room and not bulkheaded off, may be included in engine-room space. If bulkheaded off, they shall not be included in engine-room space but be given separate deductions under item 5 of Panama Canal certificate.]

64. The cubical contents of the above-named spaces occupied by the engine rooms shall be ascertained in the following manner: Measure the mean depth of the space occupied by the engines and boilers from its crown to the ceiling at the limber strake; measure also three or, if necessary, more than three, breadths of the space at the middle of its depth, taking one of such measurements at each end and another at the middle of the length; take the mean of such breadths; measure also the mean length of the space between the foremost and aftermost bulkheads or limits of its length, excluding such parts, if any, as are not actually occupied by or required for the proper working of the engines and boilers. Multiply together these three dimensions of length, breadth, and depth, and the product will be the cubical contents of the space below the crown. Then, by multiplying together the length, breadth, and depth, find the cubical contents of the space or spaces, if any, which are framed in for the machinery, for inclosing the funnels, or for the admission of light and air, and which are located between the crown of the engine room and the uppermost deck or covering of the first or lowest tier of side-to-side erections, if any, on the upper deck, as defined in Article IV, section 3. Add such contents, as well as those of the space occupied by the shaft trunk and by any donkey engine and boiler located within the boundary of the engine room or of the light and air casing above the engine room, and used in connection with the main engines for propelling the ship, to the cubical contents of the space below the crown of the engine room; divide the sum by 100 or by 2.83, according as the measurements are taken in feet or meters, and the result shall be deemed to be the tonnage of the engine and boiler room and shall be the tonnage taken as the basis for calculating the deduction for propelling power.

65. If in any ship in which the space for propelling power is to be measured the engines and boilers are in separate compartments, the contents of each compartment shall be measured separately in like manner, according to the above method, and the sum of the tonnage of the spaces included in the several compartments shall be deemed to be the tonnage of the engine and boiler rooms and shall be the tonnage taken as the basis for calculating the deduction for propelling power.

66. *Article XIV.*—When vessels are fitted with fixed coal bunkers or with fuel-oil tanks or double-bottom fuel compartments which can not be used to stow cargo or stores, and when such bunkers, tanks, and fuel compartments have been certified by official marking to be spaces for the vessel's fuel, the deduction for propelling power may either be in accordance with the provisions of Article XIII above, or by deducting the actual tonnage of the spaces enumerated in Article XII, section 2, as measured in accordance with the following provisions, as the owner of the vessel may elect: Measure the mean length of the engine and boiler room, including the coal bunkers. Ascertain the area of three transverse sections of the ship (as set forth in the rules given in Articles VIII or IX for the calculation of the gross tonnage) to the deck which covers the engine. One of these three sections must pass through the middle of the aforesaid length and the two others through the two extremities. Add to the sum of the two extreme sections four times the middle one and multiply the sum thus obtained by the third of the distance between the sections. This product divided by 100 if the measurements are taken in English feet, or by 2.83 if they are taken in meters, gives the tonnage of the space measured. If the engines, boilers, and bunkers are in separate compartments, measure each compartment, as above set forth, and add together the results of the several measurements. The bunkers measured for fuel deductions shall include only those bunkers that are absolutely permanent, from which the coal can be trimmed directly into the engine room or stokehole and into which access can be obtained only through the ordinary coal chutes on deck and from doors opening into the engine room or stokehole. Thwartship bunkers that can be in any way extended are not to be included in the measurements for deductions. When any portion of the engine or boiler rooms is occupied by a tank for fresh water, the space considered to be within the engine and boiler rooms shall be reduced by the space taken up by the tank for fresh water.

67. The contents of the shaft trunk shall be measured by ascertaining and multiplying together the mean length, breadth, and height. The product divided by 100, or 2.83, according as the measurements are taken in English feet or in meters, gives the tonnage of such space. When the shafts of screw propellers pass through open spaces not inclosed within tunnels, the spaces allowed in lieu of tunnels must be of reasonable dimensions suitable for the vessel in question.

68. The tonnage of the following spaces below the deck or covering of the first or lowest tier of side-to-side erections, if any, on the upper deck, as defined by Article IV, section 3, is ascertained by

the same method, viz: (*a*) The spaces framed in around the funnels; (*b*) the spaces required for the admission of light and air into the engine room; (*c*) the spaces, if any, necessary for the proper working of the engines; (*d*) spaces occupied by the donkey engine and boiler when used in connection with the main engines for propelling the ship and when situated within the boundary of the engine room or of the casing above the engine room; (*e*) fuel-oil tanks and double bottom compartments fitted for the stowage of fuel oil.

69. *Article XV.*—Under no circumstances shall any space which has not been included in the gross tonnage be deducted from gross tonnage.

70. The use of the whole or any portion of a deducted space, other than fuel spaces deducted under Article XIII, to stow cargo of any kind or stores other than boatswain's stores, or to provide passenger accommodations, shall be evidence that the entire space thus wholly or partially occupied is a part of the actual earning capacity of the ship, and the entire space shall be added to and become a permanent part of the net tonnage upon which Panama Canal tolls shall be collected.

71. *Article XVI.*—Only such officials as are authorized in the several foreign countries and in the United States to measure vessels and to issue tonnage certificates for purposes of national registry, and such other officials as are authorized by the President of the United States, or by those acting for him, to measure vessels and to issue Panama Canal tonnage certificates, shall have authority to measure vessels for Panama navigation or to issue Panama tonnage certificates.

72. *Article XVII.*—Tonnage certificates presented at the Panama Canal shall be subject to correction by the official or officials authorized by the President of the United States, or by those acting for him, to administer these measurement rules, in so far as may be necessary to make the certificates conform to these rules.

73. *Article XVIII.*—The Panama Canal tonnage certificates issued by the measurement authorities of the United States and the several foreign countries shall correspond in substance and form to the sample certificate appended to these rules. Blank certificates in English will be furnished by the Secretary of War or the Governor of the Panama Canal upon request of the measurement authorities of foreign countries. The measurement authorities of any foreign country may also provide themselves with Panama Canal measurement certificates printed in English or in the language of the foreign country, provided such certificates strictly correspond in substance and form to the sample certificate appended to these rules.

VESSELS OF WAR, OTHER THAN ARMY AND NAVY TRANSPORTS, COLLIERS, SUPPLY SHIPS, AND HOSPITAL SHIPS

74. *Article XIX.*—The toll on warships, other than Army and Navy transports, colliers, supply ships, and hospital ships, shall be based upon their tonnage of actual displacement at the time of their application for passage through the canal. The displacement tonnage of such warships shall be their displacement before the vessels have taken on such coal, fuel oil, stores, or supplies as may be purchased and taken on board after arrival at the canal for transit through the same.

75. *Article XX.*—"Warships" in the meaning of Articles XIX to XXIV shall be considered to be all vessels of war, other than Army and Navy transports, colliers, hospital ships, and supply ships, as defined in Article I. Warships are vessels of Government ownership that are being employed by their owners for military or naval purposes.

76. *Article XXI.*—Every warship, other than Army and Navy transports, colliers, supply ships, and hospital ships (as defined in Article I), upon applying for passage through the Panama Canal shall, in order to facilitate the ascertainment of its mean draft, be anchored or placed at such station or location as shall be designated by the Governor of the Panama Canal or by the officials authorized to act for him.

77. *Article XXII.*—The commander of every warship, other than Army and Navy transports, colliers, supply ships, and hospital ships (as defined in Article I), applying for passage through the Panama Canal shall exhibit for examination by the Governor of the Panama Canal or by the officials authorized to act for the Governor of the Panama Canal an official document containing the vessel's curve of displacement, its curves for addition to displacement for change of trim, and a scale so arranged that the displacement at any given mean draft is shown. Such document or documents shall be issued and be certified as correct by competent authorities of the Government to which the vessel belongs.

78. *Article XXIII.*—The actual displacement of warships shall be determined from their official displacement scale and curves and shall be expressed in tons of 2,240 pounds. Should the displacement scale and curves of a warship show or state the vessel's displacement tonnage in metric tons of 2,204.62 pounds, the tonnage so expressed shall be multiplied by 0.9842 for the purpose of converting the tonnage into tons of 2,240 pounds.

79. *Article XXIV.*—Should any warship, other than Army and Navy transports, colliers, supply ships, and hospital ships (as defined in Article I), apply for passage through the Panama Canal and, for reasons satisfactory to the Governor of the Panama Canal, not have on board the duly certified document or documents specified in Article XXII, the Governor of the Panama Canal, or the officials authorized to act for him, shall then determine the displacement of the vessel, using such reliable data as may be available, or by taking such dimensions of the vessel and using such approximate methods as may be considered necessary and practicable. The displacement tonnage so determined shall be considered to be the displacement of the vessel.

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PANAMA CANAL TONNAGE CERTIFICATE

Name of ship _____

Official number	Signal letters	Port of registry	Registered tonnages		Length	Beam	Depth
			Gross	Net			

DETAILS OF PANAMA CANAL GROSS TONNAGE

	Tons of 100 cubic feet	Tons of 100 cubic feet
The spaces measured for gross tonnage in this ship comprise the following and no others, viz:		
1. Space or spaces under the tonnage deck, viz:		
(a) Spaces between tonnage deck and double botton		
(b) Double-botton compartments available for fuel, feed-water, or stores		
Total space under tonnage deck		
2. Space or spaces between the tonnage deck and uppermost full length deck		
	Tons of 100 cubic feet	
3. Closed-in spaces in permanent constructions above uppermost full length deck:		
(a) Forecastle		
(b) Bridge space		
(c) Poop		
(d) Break or breaks		
(e) Turret space ____tons, (f) Trunk space ____tons		
(g) Roundhouses ____tons, ____tons, ____tons, ____tons, ____tons, ____tons ____tons, ____tons, ____tons, ____tons, ____tons, ____tons		
(h) Side houses ____tons, ____tons, ____tons, ____tons, ____tons, ____tons		
(i) Companion house or companionway (portion used for special purposes)		
(j) Passageways serving measured spaces		
(k) Cookhouses, galleys, bakeries, and condenser spaces		
(l) Lavatories, water-closets, latrines, privies, toilets, wash and bath rooms		
(m) Wheelhouses, chart house, house for donkey engine and boiler, spaces for anchor gear, steering gear and capstan, radio house, and other closed-in spaces used in working the ship		
(n) Hatchways ____ ____tons, ____tons, ____tons, ____tons, ____tons ____tons, ____tons, ____tons, ____tons, ____tons, ____tons		
Total ____tons. One-half per cent of the gross tonnage ____tons. Excess		
Total closed-in spaces on or above the uppermost full length deck		
Panama Canal gross tonnage		

DEDUCTIONS FROM GROSS TONNAGE*

	Tons of 100 cubic feet	Tons of 100 cubic feet
1. Crew accommodations and passageways serving them:		
(a) Seamen ____tons, Firemen ____tons, Quartermasters ____tons ____tons, Motormen ____tons, Apprentices ____tons Donkeyman ____tons, Greasers ____tons, ____tons Cooks ____tons, Oilers ____tons, Mess boys ____tons ____tons, ____tons, ____tons Passageways ____tons, ____tons, ____tons, ____tons		
(b) Messrooms ____tons, ____tons. Hospital ____tons Bathrooms ____tons, ____tons, ____tons		
2. Officers' accommodations and passageways serving them:		
(a) Chief officer ____tons, Chief Engineer ____tons, Boatswain ____tons 2d officer ____tons, 2d engineer ____tons, Carpenter ____tons 3d officer ____tons, 3d engineer ____tons, Radio operator ____tons 4th officer ____tons, 4th engineer ____tons, ____tons ____tons, ____tons, Steward ____tons ____tons, ____tons, Doctor ____tons Passageways ____tons, ____tons, ____tons, ____tons		
(b) Messrooms: Officers ____tons, Engineers ____tons, Petty officers ____tons		
(c) Bathrooms: Officers ____tons, Engineers ____tons, Petty officers ____tons		
(d) Master's cabin ____tons, Office ____tons, Bath ____tons, W. C ____tons		
3. Galleys, cookhouses, bakeries, etc., for exclusive use of officers, engineers and crew: Galley ____tons, Pantry ____tons, Bakery ____tons ____tons, ____tons, ____tons		
4. Lavatories, water-closets, etc., for exclusive use of officers and crew, and passageways serving them: Seamen's W. C ____tons, Officers' W. C ____tons, Engineers' W.C. ____tons ____tons, ____tons, ____tons Firemen's W. C ____tons, Petty officers W. C ____tons. ____tons		
5. Closed-in spaces used in working the ship, and passageways serving them: Chart house ____tons, Radio house ____tons, Wheelhouse ____tons Ice machine ____tons, Anchor gear ____tons, Carpenter shop ____tons Steering gear ____tons, ____tons, Dynamo ____tons Donkey E. and B. room ____tons. ____tons, Pump room ____tons		
6. Sailroom as limited under Art. X, Sec. 6† ____tons, ____tons, Total ____tons		
7. Boatswain's storerooms, limited by Art. X, Sec. 7: Peaks ____tons, Lamp room ____tons, Paint room ____tons, ____tons, ____tons, Total ____tons		
8. Water ballast spaces other than D. B. compartments: F. P. T ____tons, A. P. T ____tons ____tons, ____tons		
9. Double-bottom feed-water compartments as under Art. XII, Sec. 5: Nos.		
Total deduction other than propelling power*		
Panama Canal net tonnage (without deduction for propelling power)		
Further deductions for propelling power in case of vessels propelled by engines:	Tons of 100 cubic feet	
Either (1) applicable to ships with fixed bunkers, fuel-oil tanks, or double-bottom compartments which can not be used to stow cargo or stores:		
(a) Engine room as measured (Art. XIV) {Tonnage below deck ____ Tween deck ____ Tonnage in bridge ____ In poop ____		
(b) Fixed coal bunkers or fuel-oil tanks and double-bottom compartments fitted for stowage of fuel oil		
Total deduction for propelling power‡		
Panama canal net tonnage (power deduction by actual measurement, Arts. XII and XIV)		
	Tons of 100 cubic feet	
Or (2) Danube rule as defined in Arts. XII and XIII:		
(a) Engine room as measured (Art. XIII) {Tonnage below deck ____ Tween deck ____ Tonnage in bridge ____ In poop ____		
(b) In a vessel with screw propellers + 75 per cent of engine room as measured		
(c) In a vessel with paddlewheels + 50 per cent of engine room as measured		
Total deduction for propelling power‡		
Panama Canal net tonnage (power deduction by Danube rule, Arts. XII and XIII)		
Fuel allowance for "In ballast" rate must not exceed ____ Long tons {Oil. Coal.		

*No space, other than fuel spaces deducted under Article XIII of the Panama measurement rules, shall be deducted unless the use to which it is to be exclusively devoted has been appropriately designated by official marking.

†Reference to articles and sections are to the "Rules for the Measurement of Vessels for the Panama Canal."

‡Limited except for tugs employed exclusively as tugs, to 50 per cent of gross tonnage.

SPACES NOT INCLUDED IN GROSS TONNAGE

[Information must be given concerning all spaces exempted from measurement]

1. Exemptions under Art. IV, sec. 1 (a)—(Name or otherwise identify)
2. Exemptions under Art. IV, sec. 1 (b)—(Name and state separately the dimensions and tonnage of the parts exempted):
   Poop
   Forecastle
   Bridge
3. Exemptions under Art. IV, sec. 1 (c)—(Name and state separately the dimensions and tonnages of the parts exempted):
   Poop
   Forecastle
   Bridge
4. Exemptions under Art. IV, sec. 2—(Name the deck and state separately the dimensions and tonnage of the parts exempted)
5. Exemptions under Art. IV, sec. 3—(Name spaces exempted):
   Spaces framed in round funnels
   Spaces framed in round light and air casings
6. Exemptions under Art. IV, sec. 4—(Name or give numbers of double-bottom compartments exempted)
7. Exemptions under Art. IV, sec. 6—(Name or otherwise identify spaces exempted)
8. Exemptions under Art. IV, sec. 7—(Name or otherwise identify spaces exempted)
9. Particulars as to hatchways (Art. IV, sec. 5) need not be restated if fully given on first page of this certificate
10. State any other particulars of exempted spaces:

This is to certify that the _____ (Nationality) _____ ship above-named has been measured in accordance with the rules for measurement of vessels for the Panama Canal, and that the particulars of tonnage contained in this certificate are correct.

Given under my hand at _____ this _____ day of _____, 192..

_____ (Signature)

_____ (Official position)

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